

the Environmental Protection Agency's forthcoming proposal to repeal the endangerment finding for greenhouse gases. Would you have time to speak with me about this sometime on Wednesday (tomorrow)? And if so, could you remind me of your phone number? Please let me know when you get the chance, and thank you for considering this request.

Best,
Maxine

--

Maxine Joselow
Climate Reporter
The New York Times
Cell: 202-948-1924
Signal: MaxineJ.55

--

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Climate Reporter
The New York Times
Cell: 202-948-1924
Signal: MaxineJ.55

From: Steven Koonin <steven.koonin@gmail.com>
Sent: Friday, August 15, 2025 8:37 PM
To: John Christy
Cc: Roy Spencer; Judith Curry; Ross McKittrick; Jeremy T. Ison
Subject: Re: New York Times request

Not really. I'll send a PDF by tomorrow.

Steven E. Koonin

On Aug 15, 2025, at 17:25, John Christy <climateman60@gmail.com> wrote:

Steve

Anything worth learning from the NYT?

John C

Sent from my iPhone

On Aug 15, 2025, at 5:44 PM, Steven Koonin <steven.koonin@gmail.com> wrote:

Here's the reporting

<https://www.nytimes.com/2025/08/15/climate/lawsuit-climate-change-report.html>

(Sorry if it's behind a paywall- I've run out of free articles to share for this month).

Steven E. Koonin

On Aug 15, 2025, at 15:36, John Christy <climateman60@gmail.com> wrote:

I said, "No comment Lisa. Take care"

John C.

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<roy.spencer@nsstc.uah.edu> wrote:

I love your response. :-)

Sent from my Verizon, Samsung Galaxy smartphone
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From: Steven Koonin <koonin@stanford.edu>

Sent: Friday, August 15, 2025 11:27:24 AM

To: Judith Curry <curry.judith@gmail.com>; Ross McKittrick
<ross.mckittrick@gmail.com>; Roy Spencer
<roy.spencer@nsstc.uah.edu>; John Christy
<climateman60@gmail.com>

Cc: Ison, Jeremy T. <jeremy.ison@hq.doe.gov>

Subject: FW: New York Times request

Expect you all might have gotten Lisa's email (second below). My response immediately below.

Dr. Steven E. Koonin
Edward Teller Senior Fellow
Hoover Institution/Stanford University
koonin@stanford.edu

From: Steven Koonin

Sent: Friday, August 15, 2025 12:25 PM

To: Lisa Friedman <lisa.friedman@nytimes.com>

Subject: RE: New York Times request

I'm not a lawyer and so not qualified to answer your question.

Dr. Steven E. Koonin
Edward Teller Senior Fellow
Hoover Institution/Stanford University
koonin@stanford.edu

From: Lisa Friedman <lisa.friedman@nytimes.com>

Sent: Friday, August 15, 2025 12:20 PM

To: steven.koonin <steven.koonin@gmail.com>; Steven Koonin
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Thanks for considering it, my cell is 202-251-2083
Lisa

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Reporter, New York Times
(202) 862-0306 office
(202) 251-2083 cell
Twitter: @LFFriedman

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Sent: Friday, August 15, 2025 4:38 PM
To: Steven Koonin; Judith Curry; Ross McKittrick; John Christy
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Subject: Re: New York Times request

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Sent: Friday, August 15, 2025 4:21 PM
To: Steven Koonin
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(202) 862-0306 office
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From: Roy Spencer <roywspencer@hotmail.com>
Sent: Wednesday, June 18, 2025 3:07 PM
To: Ross McKittrick; Judith Curry; John Christy; Steven Koonin; Travis Fisher; Josh Loucks
Subject: Re: isotope ratios

Yeah, I saw that. I don't think it's necessary to mention it... too early to tell if such a source could be increasing with time by enough to make much of a difference to the evidence that virtually all CO2 increase is from anthropogenic sources. - Roy

From: Ross McKittrick <ross.mckittrick@gmail.com>
Sent: Wednesday, June 18, 2025 1:54 PM
To: Judith Curry <curry.judith@gmail.com>; Roy W. Spencer <roywspencer@hotmail.com>; John Christy <climateman60@gmail.com>; Steven Koonin <steven.koonin@gmail.com>; Travis Fisher <travis.scott.fisher@gmail.com>; Josh Loucks <loucksj14@gmail.com>
Subject: isotope ratios

Here pointing to a post on a topic I know precisely nothing about
<https://wattsupwiththat.com/2025/06/17/the-carbon-isotope-fingerprint-just-got-smudged-and-i-owe-some-of-you-an-apology/>

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From: Steven Koonin [steven.koonin@gmail.com]
Sent: 8/14/2025 5:26:45 PM
To: 'Judith Curry' [curry.judith@gmail.com]
CC: 'Ross McKittrick' [ross.mckittrick@gmail.com]; 'John Christy' [climatemanager60@gmail.com]; 'Roy W. Spencer' [roywspencer@hotmail.com]
Subject: RE: NAS committee membership posted
Attachments: ~WRD0001.jpg

Looking now myself at the bios, I expect the focus will be impacts on public health and on ecosystems. As Judy notes, only 3 with backgrounds that would let them look critically at physical climate science.

Health impacts of local pollutants are obvious; of CO2-induced temperature rise, not so much.

From: Judith Curry <curry.judith@gmail.com>
Sent: Thursday, August 14, 2025 10:57 AM
To: Steven Koonin <steven.koonin@gmail.com>
Cc: Ross McKittrick <ross.mckittrick@gmail.com>; John Christy <climatemanager60@gmail.com>; Roy W. Spencer <roywspencer@hotmail.com>
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i read the bios, very much focused on energy and the environment (only 3 climate scientists)
Not clear what angle they will take on their report

On Thu, Aug 14, 2025 at 7:20 AM Steven Koonin <steven.koonin@gmail.com> wrote:

<https://www.nationalacademies.org/our-work/anthropogenic-greenhouse-gases-and-us-climate-evidence-and-impacts#sectionCommittee>

Steven Koonin

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Judith Curry, President
CFAN - Climate Forecast Applications Network
Reno, NV USA
curry.judith@cfanclimate.com | +1.404.803.2012
<http://www.cfanclimate.net>

From: Ross McKittrick <ross.mckitrick@gmail.com>
Sent: Thursday, August 14, 2025 11:23 AM
To: Steven Koonin
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Subject: Re: NAS committee membership posted

Speaking of demographics I don't think the scenarios crowd has come to terms with the global fertility crash. There simply won't be the number of people later this century that the UN forecast even 10 years ago.

On Thu, Aug 14, 2025 at 11:19 AM Steven Koonin <steven.koonin@gmail.com> wrote:
And the three drivers of surging energy demand:

Demographics, Development, and Data

Steven E. Koonin

On Aug 14, 2025, at 08:16, John Christy <climateman60@gmail.com> wrote:

I wonder if they will address the elephant in the room, that energy has been responsible for the fantastic enhancement of human health and life.

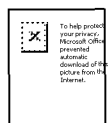
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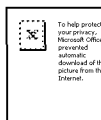
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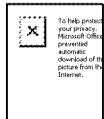
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i read the bios, very much focused on energy and the environment (only 3 climate scientists)
Not clear what angle they will take on their report

On Thu, Aug 14, 2025 at 7:20 AM Steven Koonin <steven.koonin@gmail.com> wrote:

<https://www.nationalacademies.org/our-work/anthropogenic-greenhouse-gases-and-us-climate-evidence-and-impacts#sectionCommittee>

Steven Koonin

--



Judith Curry, President
CFAN - Climate Forecast Applications Network
Reno, NV USA
curry.judith@cfanclimate.com | +1.404.803.2012
<http://www.cfanclimate.net>

From: Judith Curry <curry.judith@gmail.com>
Sent: Thursday, August 14, 2025 10:54 AM
To: Ross McKittrick
Cc: Steven Koonin; John Christy; Roy W. Spencer
Subject: Re: NAS committee membership posted

Markia Holland was my student. sea ice and climate modelling person

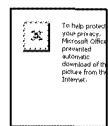
On Thu, Aug 14, 2025 at 7:32 AM Ross McKittrick <ross.mckittrick@gmail.com> wrote:
The only name I recognize is Graeme Stephens.

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interesting, other than titley none are advocates.

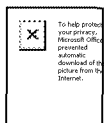
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From: Steven Koonin <steven.koonin@gmail.com>
Sent: Thursday, August 14, 2025 10:21 AM
To: Ross McKittrick; John Christy; Judith Curry; Roy W. Spencer
Subject: NAS committee membership posted

<https://www.nationalacademies.org/our-work/anthropogenic-greenhouse-gases-and-us-climate-evidence-and-impacts#sectionCommittee>

Steven Koonin

From: Steven Koonin <steven.koonin@gmail.com>
Sent: Saturday, May 31, 2025 11:21 AM
To: 'John Christy'
Cc: 'judith curry'; 'Travis Fisher'; 'Roy Spencer'; 'Ross McKittrick'; 'Josh Loucks'
Subject: RE: NCA5 editable chapter files

Some comments interspersed in red

I'm commenting my way through Ch 1. Endemic problems are truncation of records, lack of scale, lack of significance and, possibly, reliance on SSP8.5 for projections.

SEK

From: John Christy <climateman60@gmail.com>
Sent: Saturday, May 31, 2025 10:26 AM
To: Steve Koonin <steven.koonin@gmail.com>
Cc: judith curry <curry.judith@gmail.com>; Travis Fisher <travis.scott.fisher@gmail.com>; Roy Spencer <roywspencer@hotmail.com>; Ross McKittrick <ross.mckittrick@gmail.com>; Josh Loucks <loucksj14@gmail.com>
Subject: Re: NCA5 editable chapter files

All

Steve: Will you be commenting on the "ratio" of extremes chart from NCA4?

We've plenty of material on this, but I think we should stick to critiquing NCA5. Don't think there's an analogous figure in that more recent report

Ross: Figs 2.4 and 2.8:

I'll finish an Upper Midwest dataset of about 50 stations for daily precipitation this weekend. I now have 31 stations in the Northeast, 29 West Coast, and 24 in Southeast. These can answer questions in Fig. 2.8 NCA5. They have odd metrics - (a) total amount falling on heaviest 1% of days, (b) 1-in-5yr daily max and (c) annual heaviest day. With the datasets I'll be sending, I think you can produce these values, but I can as well. Note they have no significance attached to any of these that I can tell ... just changes since 1958. So, by explaining how significance is determined for precipitation metrics we will likely show there will always be changes, but their significance is a detail that the NCA5 ignored. Also Fig 21.1 for the Northeast precipitation can be addressed.

Yes, no significance given for trends nor is scale set for big numbers.

Box 4.1: I'll finish the snowfall time series for the Cascades and the Sierras through the 2024-25 season this weekend and this can address Box 4.1 which showed a recent bad snow year for the west (which shows up in my time series, but so does the big year of 2022-23). You can run the significance values for the trends, but I suspect no significance for the slight rise in snowfall in the Cascades and slight decline in the Sierras since the late 19th century.

One year does not a climate make. They keep ignoring that.

Roy: Fig 2.9. I think showing the corn belt trends will shut down this figure - model trends are 50% to 700% too hot already, so projections are not fit-for-purpose.

They really believe the regional projections (or at least pretend to). Shameful.

Judy: Pgs 2-16, 2-17. Will you be addressing the 2021 PacNW heat wave? I imagine you all saw that a woman is suing the oil companies for her mother's death in a hot car during that event. <https://apnews.com/article/climate-change-oil-greenhouse-gas-emissions-illness-816898178e91d3dd61d87b2d90d34ad5>

We should just lift the text out of our report.

Possible pithy saying: "When you can measure what you are speaking about, and express it in numbers, you know something about it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind." William Thomson (Lord Kelvin, 1824-1907)

-or-

"All science is numbers" - Richard Lindzen translation.

I know well, and often cite, the Kelvin quote. Some people believe it's just physicist's arrogance, but it is true. John C.

John Christy
Director, Earth System Science Center
Professor, Atmos and Earth Science
Alabama State Climatologist
The University of Alabama in Huntsville
climateman60@gmail.com

On May 31, 2025, at 8:02 AM, Steven Koonin <steven.koonin@gmail.com> wrote:

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To facilitate commenting and editing, I've turned Chapters 1-3 into editable pdfs (unfortunately, BW only and the largest is still some 82 MB). They can be found at this DropBox link:

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Steve Koonin

From: Judith Curry <curry.judith@gmail.com>
Sent: Sunday, August 17, 2025 12:49 PM
To: Ross McKittrick
Cc: Roy W. Spencer; John Christy; Steven Koonin
Subject: Re: Rapid Intensification

yes good article. I'm working on a mini report for my clients re Erin's rapid intensification, i will send a copy in case any of you are interested

On Sun, Aug 17, 2025 at 9:18 AM Ross McKittrick <ross.mckittrick@gmail.com> wrote:
Interesting substack from Jessica Weinkle on hurricane rapid intensification which includes mention of our report.

----- Forwarded message -----

From: Jessica Weinkle from Conflicted <jessicaweinkle@substack.com>
Date: Sun, Aug 17, 2025 at 6:20 AM
Subject: Rapid Intensification
To: <ross.mckittrick@gmail.com>

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Rapid Intensification

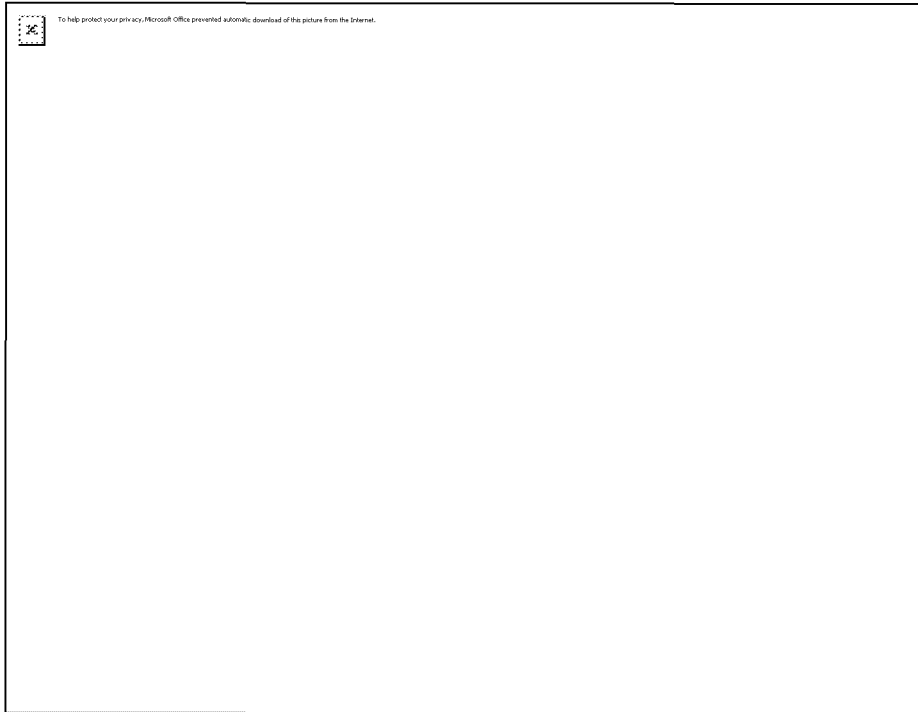
Our technologies have come a long way!

JESSICA WEINKLE

AUG 17



READ IN APP



1944 Navy hurricane reconnaissance team flying WWII Bombers B-25 to gather hurricane data

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The global frequency of TC rapid intensification events has likely increased over the past four decades.

From my read of the discussion among scientists, the IPCC report, and the DOE report, my opinion is that technological advancement in recent decades-particularly as it pertains to the capabilities of the Hurricane Hunters, makes it difficult to say definitive things about trends in rapid intensification. This is especially so because these things happen out at sea.

One cannot discredit the first half of the hurricane record for data quality issues and then proclaim definitive things about the latter half of the record because of its high data quality.

Thus, where the DOE reports states:

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Thanks for reading Conflicted! Subscribe for free to receive new posts and support my work.

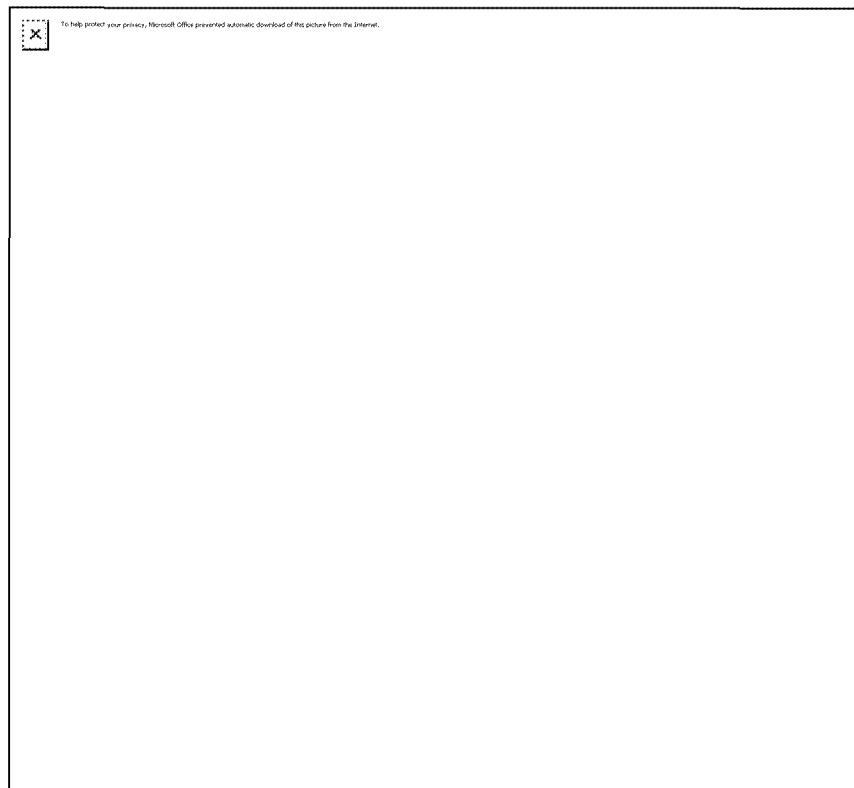


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The media was awash with loud claims linking rapid intensification to fossil fuel emissions and anthropogenic climate change.

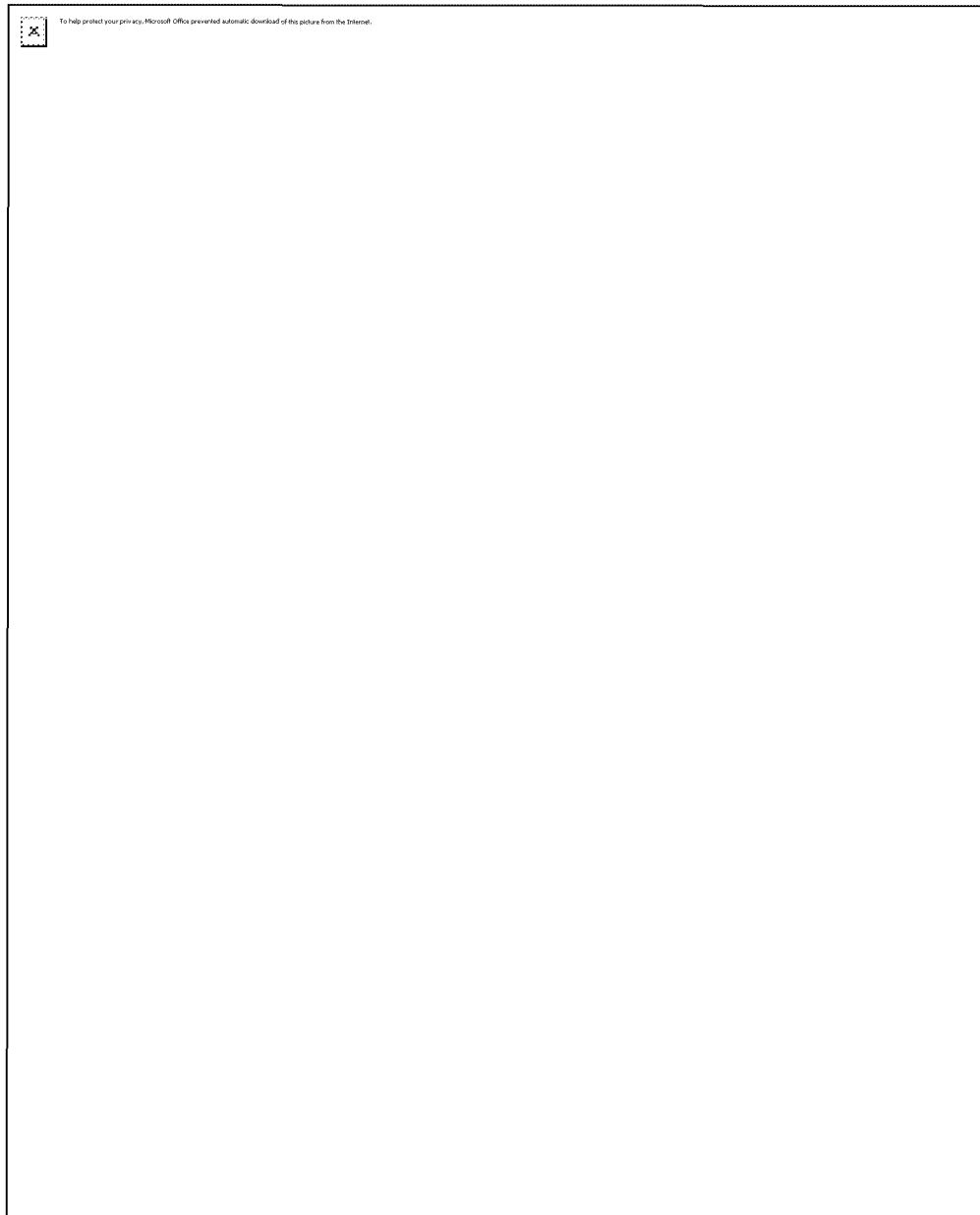


NBC's National Climate Reporter

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The statement deserves some context, and a proper tribute to the nation's hurricane hunters and forecasters.



NOAA's Hurricane Hunter's capturing data to support forecasting

A characteristic of the chatter about Milton's forecasting efforts is its emphasis on the work of the Hurricane Hunters. These are brave teams under NOAA and Air Force Reserve that fly into hurricanes to collect data in support of NHC forecasting efforts.

The practice is referred to as hurricane reconnaissance and it began in 1944. The photo at the top of the page is the first team (then, with the Army Air Force) to have made this effort. The reconnaissance team made their trip in a B-25, a popular WWII bomber.



Hurricane reconnaissance was a game changer for forecasting and observation capabilities prior to the development of satellites in the 1960s. By comparison, meteorologists recounting the experience forecasting the 1926 Great Miami Hurricane note that a challenge in getting a hurricane warning out to Miami was in part due to a lack of data about the storm as it moved west past the Bahamas into open water:

The notable feature of this table [ie observation data] is the small number of reports from oceanic areas and this is strikingly manifest for the 17th-the critical date. It may be that the advance notice of the presence of the storm deterred vessel masters from entering the storm area; any event the absence of reports from oceanic areas a critical times must be a serious handicap to any organization that attempts to forecast the coming of these destructive storms.

So, the development of aircraft reconnaissance was a big deal for hurricane forecasting.

Even still what hurricane hunters offer today is heaps more than they could in earlier days when they were limited not just by meteorological technology but by aircraft capability.

A 2012 paper by Andrew Hagan and Chris Landsea, cautions against about making adamant statements about trends regarding strong hurricanes in recent decades. They

find that historic methods would not have captured characteristics of the strongest hurricanes with which we have recent experience:

The results suggest that intensity estimates for extreme tropical cyclones prior to the satellite era are unreliable for trend and variability analysis

There are specific mentions of the inability to capture rapid intensification of storms. This excerpt notes that in the 1940s, meteorologists would not have captured rapid intensification of Hurricane Katrina (2005):

The rapid intensification and subsequent rapid weakening that occurred in the Gulf of Mexico would not have been captured with the observational platforms of the late 1940s/early 1950s, and Katrina very likely would not have been listed as a Category 5. It would have been assumed that Katrina slowly intensified until reaching its peak intensity at landfall in Louisiana.

Should rapid intensification occur at night reconnaissance efforts defiantly would not have captured it because they did not fly at night nor did they fly into storms this strong. Here for Hurricane Wilma (2005):

The next aircraft flight occurred at night, and no intensity information was available during the late 1940s/early 1950s at night. That is the night when Wilma underwent its extreme rapid intensification. The first fix during daylight occurred at 1806 UTC 19 October. Aircraft in the late 1940s and early 1950s would not have been able to penetrate the center since the central pressure was below 940 mb.

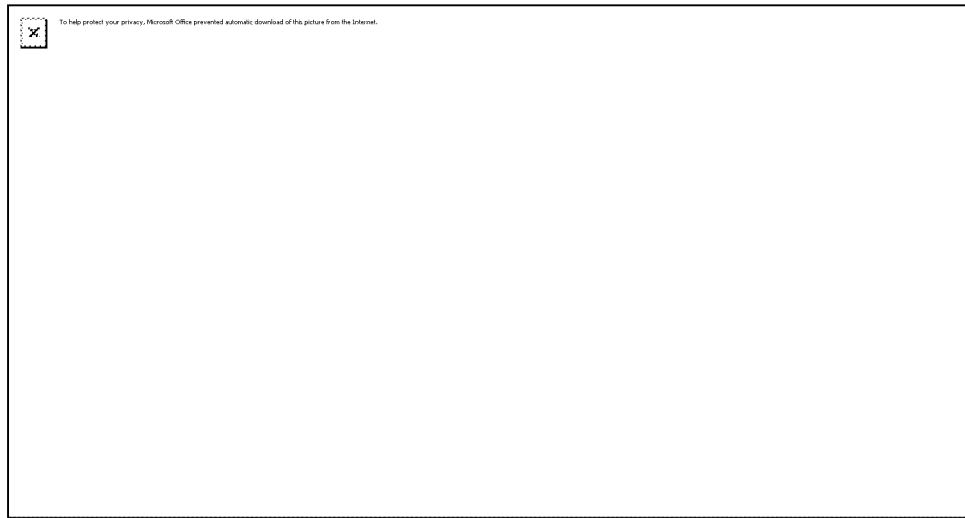


What Hurricane Hunters are able to do today is a technological feat in comparison to what they could do in the 1940s. Hagan and coauthors (2012) give a careful account of the first decade of aircraft reconnaissance noting basic limitations:

Aircraft central pressures were only reported during daylight hours due to the need to visually see the ocean surface and primarily in tropical storms and minor hurricanes. Beginning in 1950 penetrations were generally attempted more often and for somewhat stronger hurricanes compared with the late 1940s (roughly a Saffir–Simpson category stronger on average). Nevertheless, it was still a

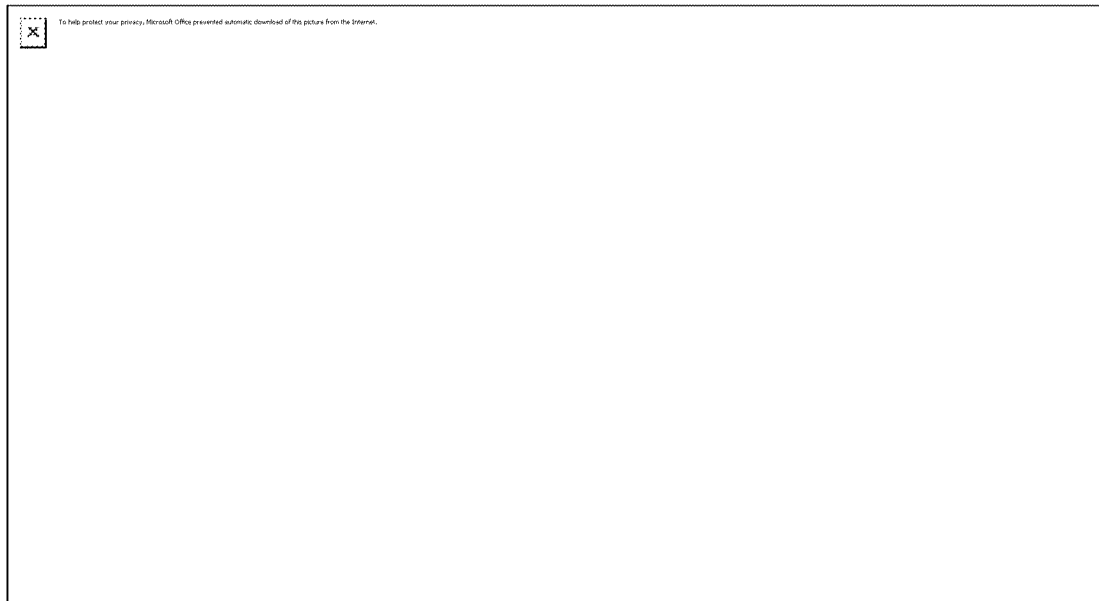
common occurrence in the 1950s for a plane to attempt a penetration and have to abort before the RMW or even the inner core was reached due to extreme turbulence causing the plane to become uncontrollable

In my own scan of the literature the earliest mention of rapid intensification occurs in discussion of 1964 Hurricane Cleo written in the *Monthly Weather Review*.



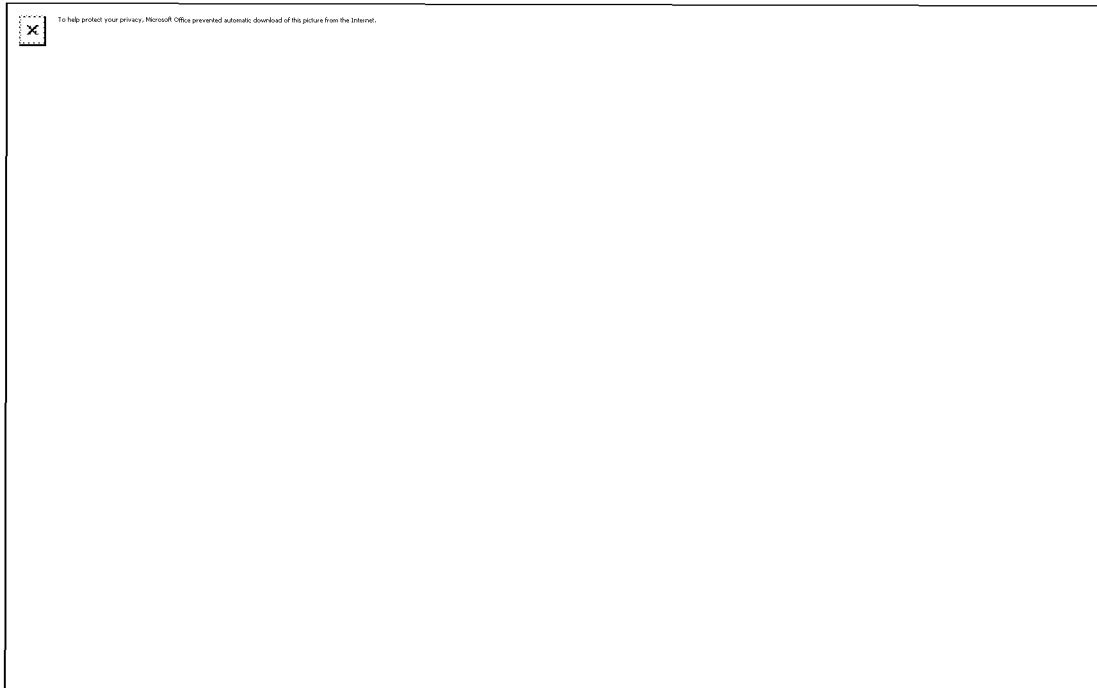
MWR in 1966

The analysis presents brief discussion of these two images.



Which -goodness me- is a far cry from the analytical data and imagery we have today. Check out Ryan Maue at Weather Trader for his collection of data, imagery, and analyses.

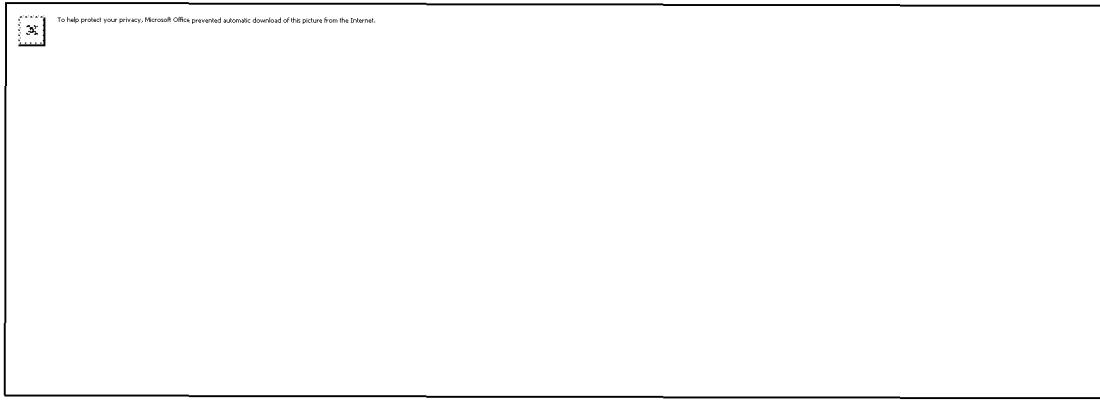
Of course, as data collection capabilities increased so too did publications on ‘rapid intensification.’ Below is the annual count of papers in Web of Science mentioning rapid intensification and hurricane or tropical cyclone.



Web of Science

Today, NOAA boasts the ability of their Hurricane Hunters to use their aircraft to get “an MRI-like look at the storm” with planes that were acquired in the 1970s (though receiving substantial updates since).

Just last month NOAA announced an order in for new planes. Imagine the capabilities then!



Left: the original reconnaissance plane Right: the plane used today

So, when viewing claims about rapid intensification and climate change keep the above context in mind- which, is not to say that anthropogenic climate change is not relevant for the study of rapid intensification.

It is more the point that our fascination with rapid intensification is guided by our more recent ability to closely observe it.

Good luck to Florida and a big *Thank You* to our Hurricane Hunters.



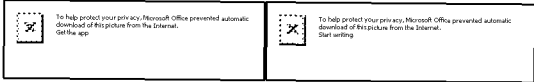
Nine weather reconnaissance missions. Nine, y'all. Nine.

Thanks for reading Conflicted! Subscribe for free to receive new posts and support my work.



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601 S. College Road, Wilmington, NC 28403

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From: Ross McKitrick <ross.mckitrick@gmail.com>
Sent: Sunday, August 17, 2025 12:19 PM
To: Roy W. Spencer; John Christy; Judith Curry; Steven Koonin
Subject: Fwd: Rapid Intensification

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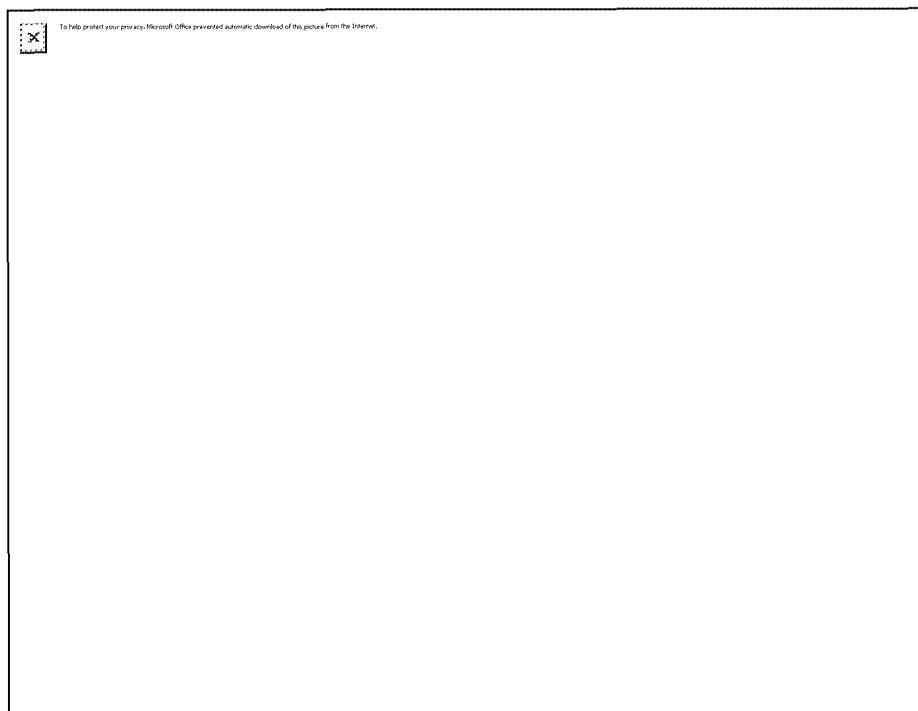
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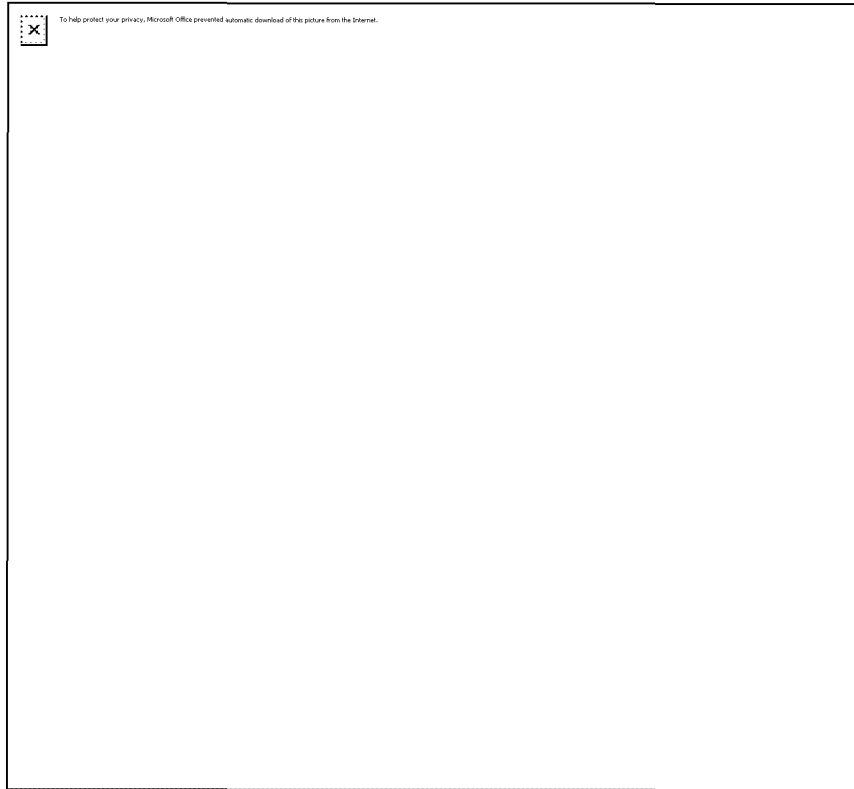


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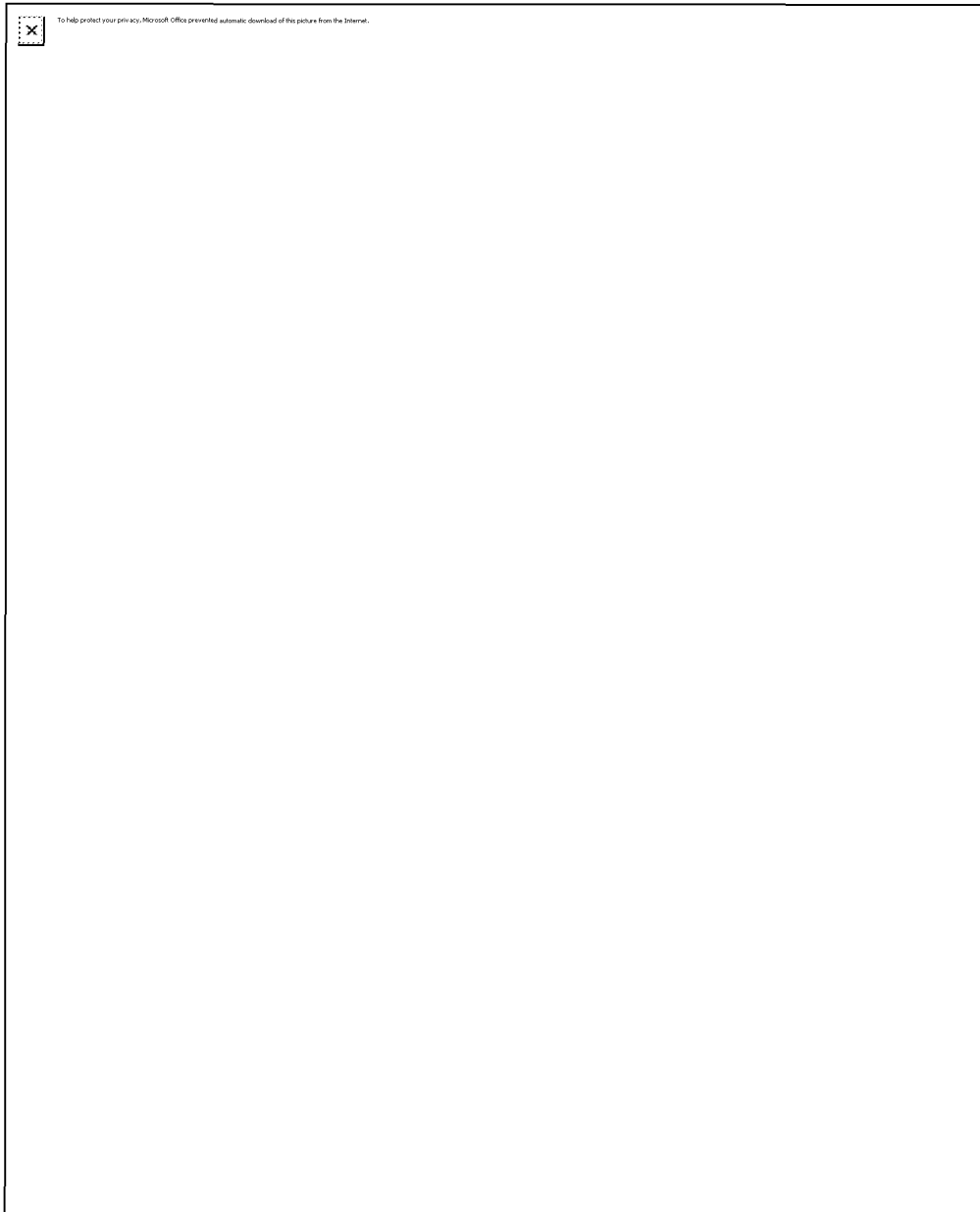


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NOAA's Hurricane Hunter's capturing data to support forecasting

A characteristic of the chatter about Milton's forecasting efforts is its emphasis on the work of the Hurricane Hunters. These are brave teams under NOAA and Air Force Reserve that fly into hurricanes to collect data in support of NHC forecasting efforts.

The practice is referred to as hurricane reconnaissance and it began in 1944. The photo at the top of the page is the first team (then, with the Army Air Force) to have made this effort. The reconnaissance team made their trip in a B-25, a popular WWII bomber.



Hurricane reconnaissance was a game changer for forecasting and observation capabilities prior to the development of satellites in the 1960s. By comparison, meteorologists recounting the experience forecasting the 1926 Great Miami Hurricane note that a challenge in getting a hurricane warning out to Miami was in part due to a lack of data about the storm as it moved west past the Bahamas into open water:

The notable feature of this table [ie observation data] is the small number of reports from oceanic areas and this is strikingly manifest for the 17th-the critical date. It may be that the advance notice of the presence of the storm deterred vessel masters from entering the storm area; any event the absence of reports from oceanic areas a critical times must be a serious handicap to any organization that attempts to forecast the coming of these destructive storms.

So, the development of aircraft reconnaissance was a big deal for hurricane forecasting.

Even still what hurricane hunters offer today is heaps more than they could in earlier days when they were limited not just by meteorological technology but by aircraft capability.

A 2012 paper by Andrew Hagan and Chris Landsea, cautions against about making adamant statements about trends regarding strong hurricanes in recent decades. They find that historic methods would not have captured characteristics of the strongest hurricanes with which we have recent experience:

The results suggest that intensity estimates for extreme tropical cyclones prior to the satellite era are unreliable for trend and variability analysis

There are specific mentions of the inability to capture rapid intensification of storms. This excerpt notes that in the 1940s, meteorologists would not have captured rapid intensification of Hurricane Katrina (2005):

The rapid intensification and subsequent rapid weakening that occurred in the Gulf of Mexico would not have been captured with the observational platforms of the late 1940s/early 1950s, and Katrina very likely would not have been listed as a

Category 5. It would have been assumed that Katrina slowly intensified until reaching its peak intensity at landfall in Louisiana.

Should rapid intensification occur at night reconnaissance efforts defiantly would not have captured it because they did not fly at night nor did they fly into storms this strong. Here for Hurricane Wilma (2005):

The next aircraft flight occurred at night, and no intensity information was available during the late 1940s/early 1950s at night. That is the night when Wilma underwent its extreme rapid intensification. The first fix during daylight occurred at 1806 UTC 19 October. Aircraft in the late 1940s and early 1950s would not have been able to penetrate the center since the central pressure was below 940 mb.



What Hurricane Hunters are able to do today is a technological feat in comparison to what they could do in the 1940s. Hagan and coauthors (2012) give a careful account of the first decade of aircraft reconnaissance noting basic limitations:

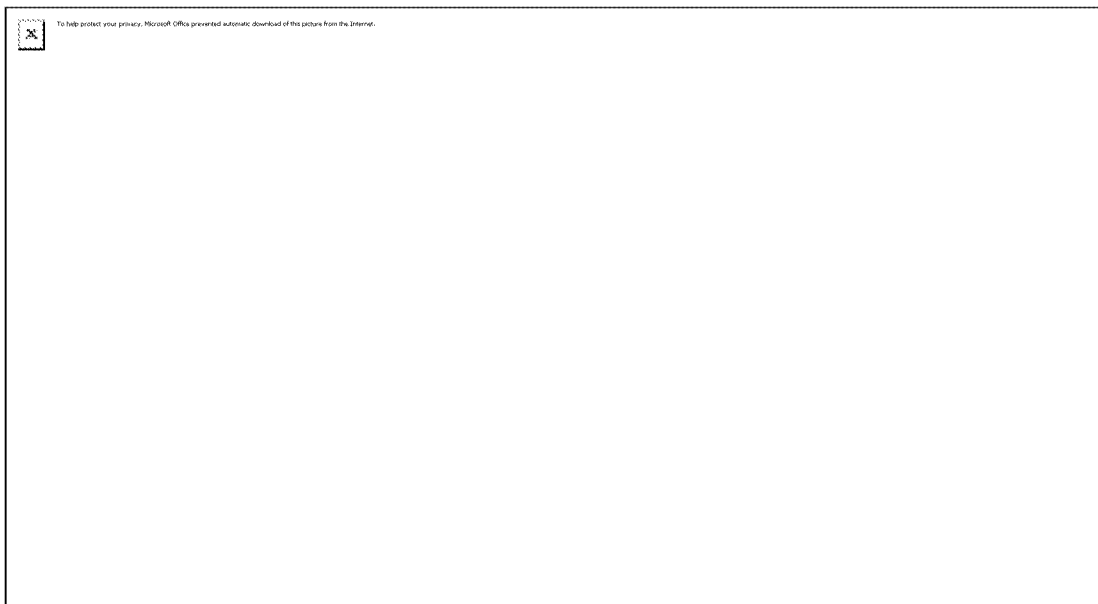
Aircraft central pressures were only reported during daylight hours due to the need to visually see the ocean surface and primarily in tropical storms and minor hurricanes. Beginning in 1950 penetrations were generally attempted more often and for somewhat stronger hurricanes compared with the late 1940s (roughly a Saffir– Simpson category stronger on average). Nevertheless, it was still a common occurrence in the 1950s for a plane to attempt a penetration and have to abort before the RMW or even the inner core was reached due to extreme turbulence causing the plane to become uncontrollable

In my own scan of the literature the earliest mention of rapid intensification occurs in discussion of 1964 Hurricane Cleo written in the *Monthly Weather Review*.



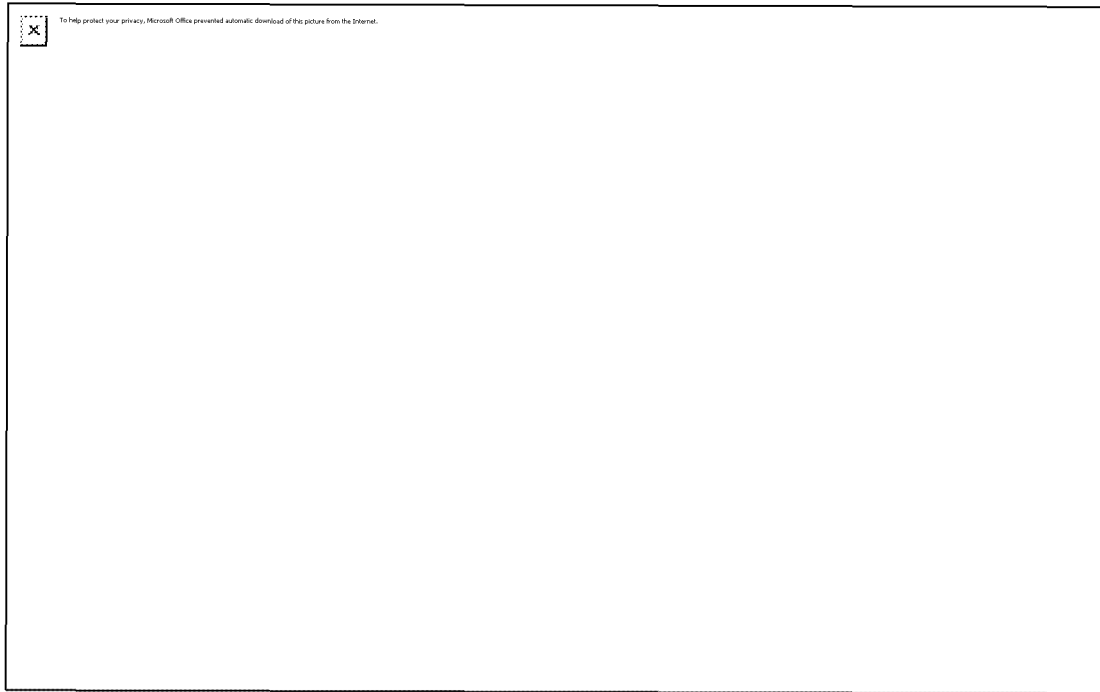
MWR in 1966

The analysis presents brief discussion of these two images.



Which -goodness me- is a far cry from the analytical data and imagery we have today. Check out Ryan Maue at Weather Trader for his collection of data, imagery, and analyses.

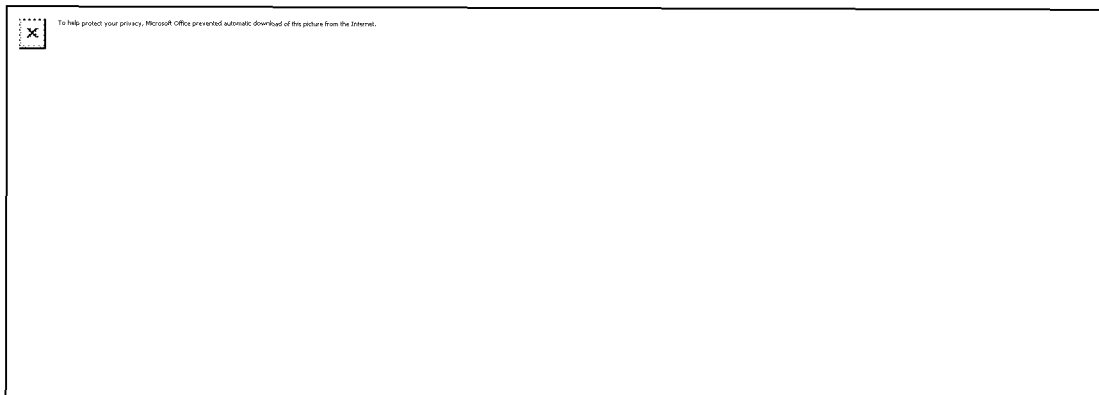
Of course, as data collection capabilities increased so too did publications on ‘rapid intensification.’ Below is the annual count of papers in Web of Science mentioning rapid intensification and hurricane or tropical cyclone.



Web of Science

Today, NOAA boasts the ability of their Hurricane Hunters to use their aircraft to get “an MRI-like look at the storm” with planes that were acquired in the 1970s (though receiving substantial updates since).

Just last month NOAA announced an order in for new planes. Imagine the capabilities then!

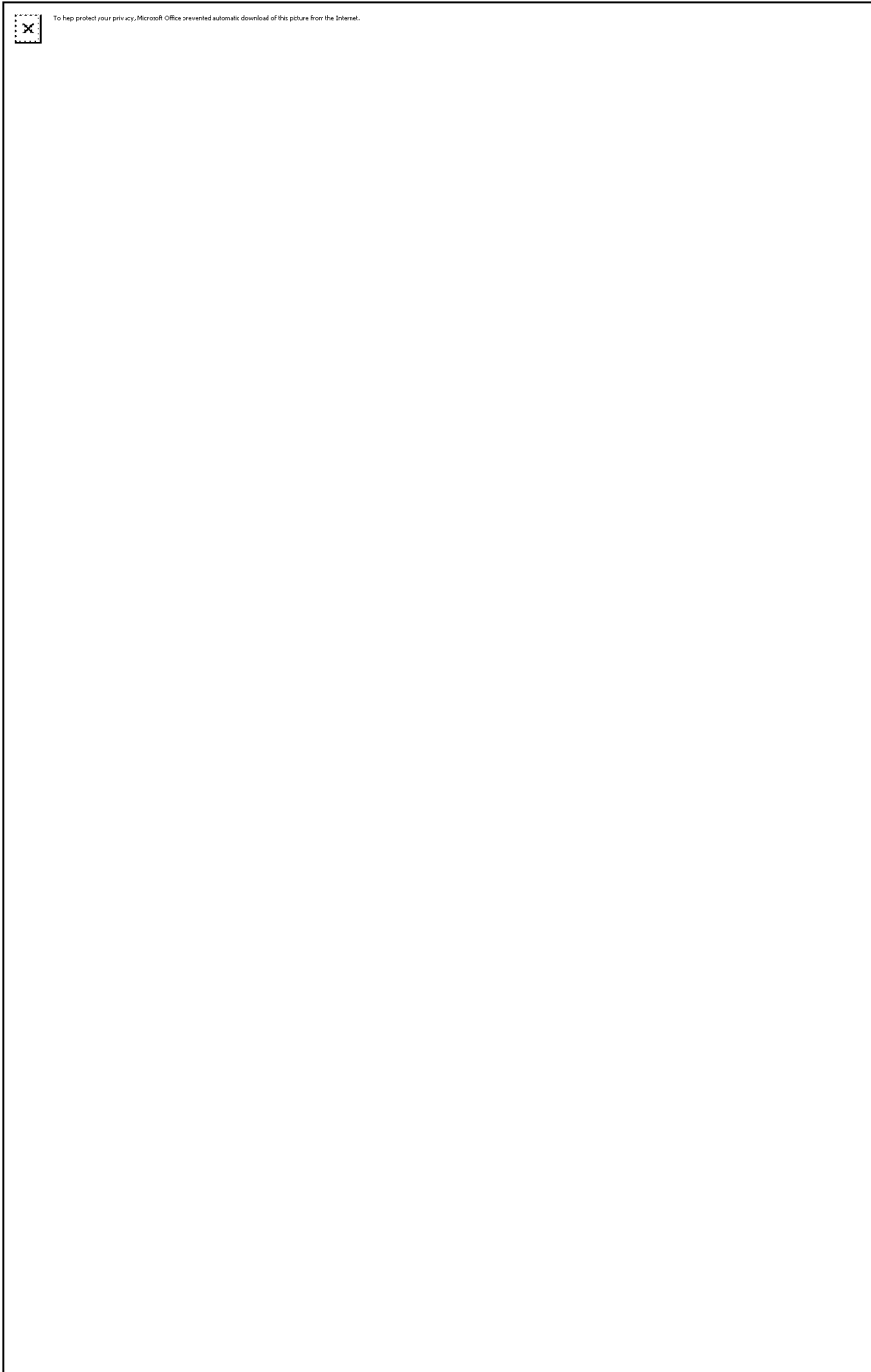


Left: the original reconnaissance plane Right: the plane used today

So, when viewing claims about rapid intensification and climate change keep the above context in mind- which, is not to say that anthropogenic climate change is not relevant for the study of rapid intensification.

It is more the point that our fascination with rapid intensification is guided by our more recent ability to closely observe it.

Good luck to Florida and a big *Thank You* to our Hurricane Hunters.



Nine weather reconnaissance missions. Nine, y'all. Nine.

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Sent: Wednesday, June 18, 2025 5:03 PM
To: John Christy
Cc: Judith Curry; Steven Koonin; Roy W. Spencer; Travis Fisher; Josh Loucks
Subject: Re: NCA5 report, June 17 edition

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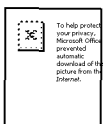
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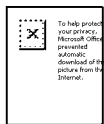
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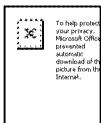
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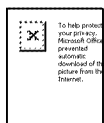
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Sent: Wednesday, June 18, 2025 9:26 AM
To: Roy Spencer
Cc: Steven Koonin; Judith Curry; John Christy; Steven Koonin; Travis Fisher; Josh Loucks
Subject: Re: NCA5 report, June 17 edition

Yes I'm creating the meeting. Can someone remind me what time the meeting is?
Ross

On Wed, Jun 18, 2025 at 3:44 AM Roy Spencer <roywspencer@hotmail.com> wrote:
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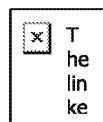
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Review of the Fifth National Climate Assessment

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EXECUTIVE SUMMARY

This report critically evaluates the Fifth National Climate Assessment (NCA5), finding it an inadequate basis for climate and energy policies. A detailed review of the foundational chapters on climate science raises several key concerns:

Scientific Integrity

- An advocacy tone, particularly in the Overview chapter, inconsistent with scientific objectivity
- An endemic overconfidence when stating conclusions, including inflated certainty levels and overstatement of findings from underlying sources

Flawed methodology

- Use of *ad hoc* time scales for trend analyses in areas such as precipitation and heatwaves
- An overemphasis on extreme scenarios for future emissions
- Inadequate traceable accounts to support key conclusions

Deficient Review Process

- A review by the National Academy of Sciences, Engineering, and Medicine (NASEM) failed to challenge some fundamental flaws in NCA5
- The NCA5 authors failed to adopt some improvements recommended by NASEM

The report shows NCA5 to be a biased and incomplete picture of climate science that skews toward excessive climate risk. Consequently, NCA5 should not be used as basis for climate and energy policies.

1 INTRODUCTION

1.1 About this Report

This report responds to a request from OSTP Director Michael Kratsios (reproduced in Appendix1) that we assess the suitability of the Fifth National Climate Assessment for informing climate and energy policies.

To conduct this assessment we reviewed NCA5 itself, the National Academies (NASEM) review of the Third Order Draft, and the USGCRP responses to that review. We have drawn upon our long experience working on advisory reports, including for the NASEM, the IPCC and other organizations, as writers, reviewers and study leaders.

We find that NCA5 should not be relied on for policy making as it is an incomplete and misleading picture of our understanding of the changing climate and the risks it poses to the nation. NCA5 was selective and incomplete in its survey of climate science as of its publication in 2023 and has become even more so in the years since. We have reviewed many key scientific developments in a separate report to Energy Secretary Wright (Climate Working Group 2025, herein denoted “CWG25”). The overall effect of the biases and omissions of NCA5 is an excessively dire picture of climate risk.

To support our finding, the following sections of this chapter provide some background on the National Climate Assessments and the standards by which we have assessed NCA5. Chapters 2 through 6 then detail important ways in which NCA5 fails to meet those standards. In Chapter 7, then follows with an assessment of the NASEM review. Finally, Chapter 8 summarizes our evaluation of NCA5.

1.2 About the National Climate Assessments

The U.S. Global Change Research Program (USGCRP) was established by Presidential Initiative in 1989 and mandated by Congress in the Global Change Research Act (GCRA) of 1990 to develop and coordinate “a comprehensive and integrated United States research program which will assist the Nation and the world to understand, assess, predict, and respond to human-induced and natural processes of global change.”

The National Climate Assessment (NCA) Reports evolved from the GCRA requirement to

Prepare and submit to the President and the Congress an assessment which (1) integrates, evaluates, and interprets the findings of the Program and discusses the scientific uncertainties associated with such findings; (2) analyzes the effects of global change on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biological diversity; and (3) analyzes current trends in global change, both human-induced and natural, and projects major trends for the subsequent 25 to 100 years.

The five NCA Reports to date have interpreted this mandate in different ways:

- NCA1 (2000) was a multidisciplinary effort to study and portray in regional detail the potential effects of human-induced global warming on the United States.
- NCA2 (2009) was a relatively short report that not only focused on the potential consequences of climate change but also sought to identify potential adaptation measures and identify the highest priorities for future research.

- NCA3 (2014) was an expanded effort that continued along the lines of NCA2, and was distinguished by a comprehensive review process, including a review by the National Academy of Sciences. NCA3 introduced a traceability analysis for each key finding, including a description of uncertainties.
- NCA4 (2017/2018) was a further expanded effort published in two volumes: I Climate Science Special Report, and II Impacts, Risk, and Adaptation in the United States. This was the first NCA report to devote significant effort to assessing climate science.
- NCA5 (2023) returned to a single volume format, reducing discussion of climate science to a cursory two chapters, with continuing with a focus on regional and sectoral impacts of climate change. NCA5 expanded its remit to topics that are arguably outside the purview of the USGCRP, focusing on “Climate Action” and policy recommendations with a social justice emphasis. NCA5’s self-description is reproduced as Appendix II.

These successive interpretations of the NCA are poorly aligned with the GCRA’s statutory requirements. Only NCA4 gives serious consideration to climate science, which receives the great majority of USGCRP funding, and even then misrepresents some important points (Section 1.4 below offers an example). Natural climate variability is essentially dismissed as unimportant in NCA4 and barely mentioned in NCA5 in most contexts, despite the mandate to include both human-caused and natural climate change. Most significantly, NCA5 has redirected the focus away from climate science and even the hazard elements of impacts, towards evaluation of societal vulnerabilities and advocacy for particular policy options, especially wind and solar power. The cover image for the NCA5 Report is the installation of a solar panel.

1.3 Standards for Assessing NCA Products

In Appendix 2 we include a letter of guidance from the Office of General Counsel, U.S. Department of Energy, summarizing the statutory requirements governing USGCRP work products in general and NCA products in particular.

We can summarize the standards applicable to the NCA as follows:

- details

Beyond the statutory requirements we draw attention to two other pertinent standards. President Trump’s executive order of May 23, 2025, “Restoring Gold Standard Science” enumerates some of the characteristics of good science:

- i. reproducible;
- ii. transparent;
- iii. communicative of error and uncertainty;
- iv. collaborative and interdisciplinary;
- v. skeptical of its findings and assumptions;
- vi. structured for falsifiability of hypotheses;
- vii. subject to unbiased peer review;
- viii. accepting of negative results as positive outcomes; and
- ix. without conflicts of interest.

Although these should be self-evident to those trained in science, it is surprising that some scientists have found them controversial.

There are other desiderata for scientific reports that will be highly influential on climate policymaking. Among them are statements about the strength of climate knowledge. The IPCC's approach is based on judgment of the available evidence and agreement among experts. More sophisticated knowledge characterizations for risk management include (Aven 2017)¹:

- The degree to which the assumptions made are reasonable/realistic based on background knowledge
- The degree to which data/information exists and are reliable and relevant
- The degree to which there is disagreement among experts (including those from different environments or academic fields)
- The degree to which the phenomena involved are understood and accurate models exist
- The degree to which the knowledge has been thoroughly examined with respect to unknown knowns

Good climate and energy policies will balance the risks and benefits of a changing climate against the world's growing demand for reliable and affordable energy. To strike that balance, policymakers must understand at least two complex and nuanced topics: the certainties and uncertainties of climate science and the technoeconomic realities of energy systems. Experts in those subjects have a unique responsibility to communicate their understanding to non-experts clearly, completely, and without bias.

Expertise in energy systems resides largely in the private sector, where it is essential to providing the reliable and affordable energy services that are the lifeblood of society. Understanding is therefore continually refined and tested by the discipline of the marketplace. In contrast, climate science expertise is found largely in the non-profit realm of universities and government laboratories and so has a more academic character.

In recent decades, climate science has engendered passion and emotion. Indeed, some younger climate scientists have gone into the field to "save the planet." Further, the field of climate science has been politicized by NetZero mandates. It is then not surprising that objectivity can suffer when climate scientists communicate their understanding to non-experts. This lack of objectivity usurps the public's right to make informed choices and undermines their confidence in the scientific enterprise.

In 1980, then-President of the National Academy of Sciences Philip Handler identified the problem in an editorial² that resonates eerily four decades later:

Difficulty arises in the scientific community from confusion of the role of scientist *qua* scientist with that of scientist as citizen, confusion of the ethical code of the scientist with the obligation of the citizen, blurring the distinction between intrinsically scientific and intrinsically political questions. When scientists fail to recognize these boundaries, their own ideological beliefs, usually unspoken, easily becloud seemingly scientific debate.

¹ Aven, Terje (2017) "Improving Risk Characterisations in Practical Situations by Highlighting Knowledge Aspects, with Applications to Risk Matrices," *Reliability Engineering & System Safety* 167 (November 2017): 42–48 <https://www.sciencedirect.com/science/article/pii/S0951832016306950>

² Handler, Philip (1980) Public Doubts About Science. *Science* 208(4448) p. 1093 <https://www.science.org/doi/10.1126/science.208.4448.1093>

1.4 When Peer Review Fails

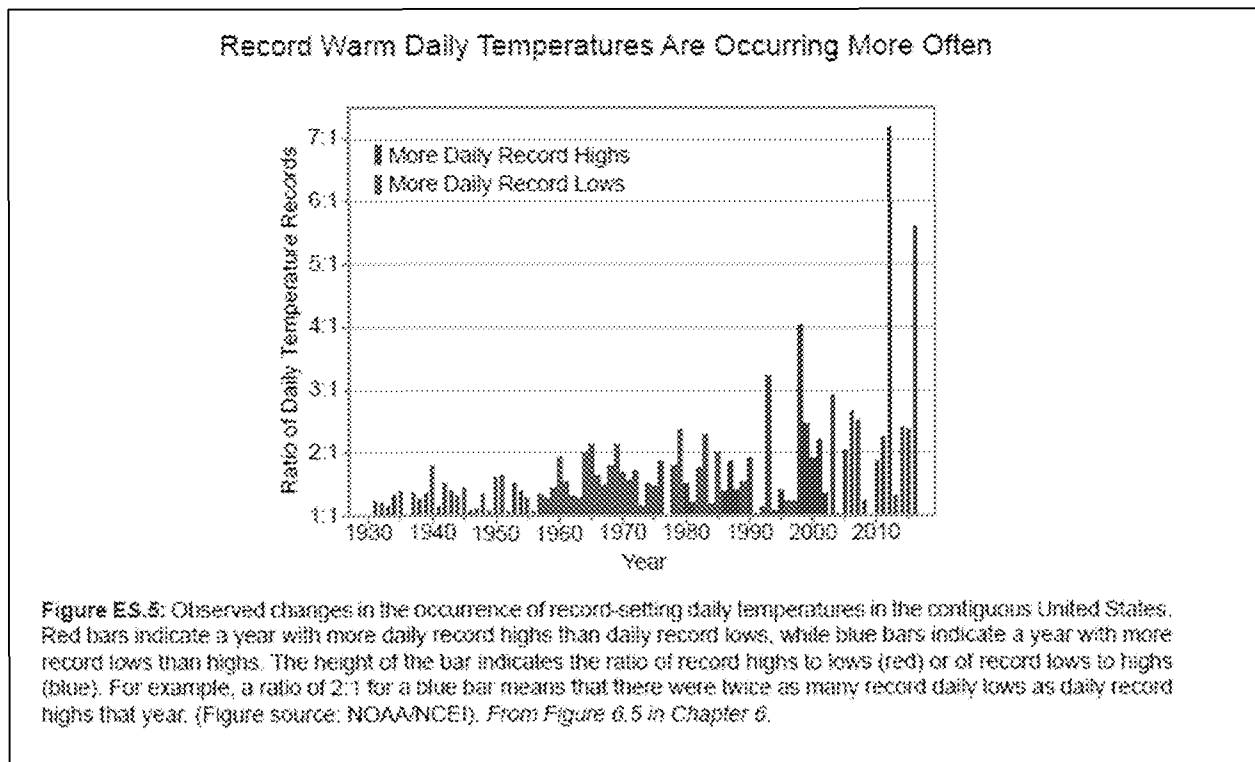
Peer review of reports like IPCC and NCA products is not a silver bullet that guarantees quality. The peer review process for these reports differs in some important respects from traditional peer review in academic journals. First, NCA reviewers are volunteers who self-select what parts of the report to read, whereas the editors of academic journals recruit reviewers and assign them to specific papers. As a result, there is no guarantee that any particular section of an NCA report was reviewed by anyone, **WHAT ABOUT THE NASEM REVIEW?** let alone by someone with a perspective that differs from the authors. In fact, many potential reviewers have given up over the years because their input has systematically been ignored. Second, NCA authors have near complete authority whether to accept or reject review comments. By contrast, the Editor of an academic journal mandates the author to respond and the reviewer and editor gets to assess its adequacy. And third, the work of an NCA chapter author team is guaranteed to be published, whereas academic journals routinely reject papers that do not pass review.

These points are important to bear in mind because some readers might dismiss any criticism of NCA products out of hand on the grounds that they were “peer reviewed”. But the test of a report is whether its contents are a valid representation of the available evidence. Here we give an example in which NCA4 gave prominence to a figure that completely misrepresented the underlying data and which evaded peer review to do so. Further details can be found in Koonin (2024).

As shown in CWG25 Section 6.3 the number of heat extremes in the U.S. peaked in the 1930s and has declined ever since. Considering cold and hot extremes together the U.S. the U.S. climate has become more moderate over time. NCA4’s Part I (Climate Science Special Report, CCSR) says (prominently and with *Very High Confidence*) on Page 19 of the Executive Summary:

There have been marked changes in temperature extremes across the contiguous United States. The number of high temperature records set in the past two decades far exceeds the number of low temperature records.

and offers this figure in support:

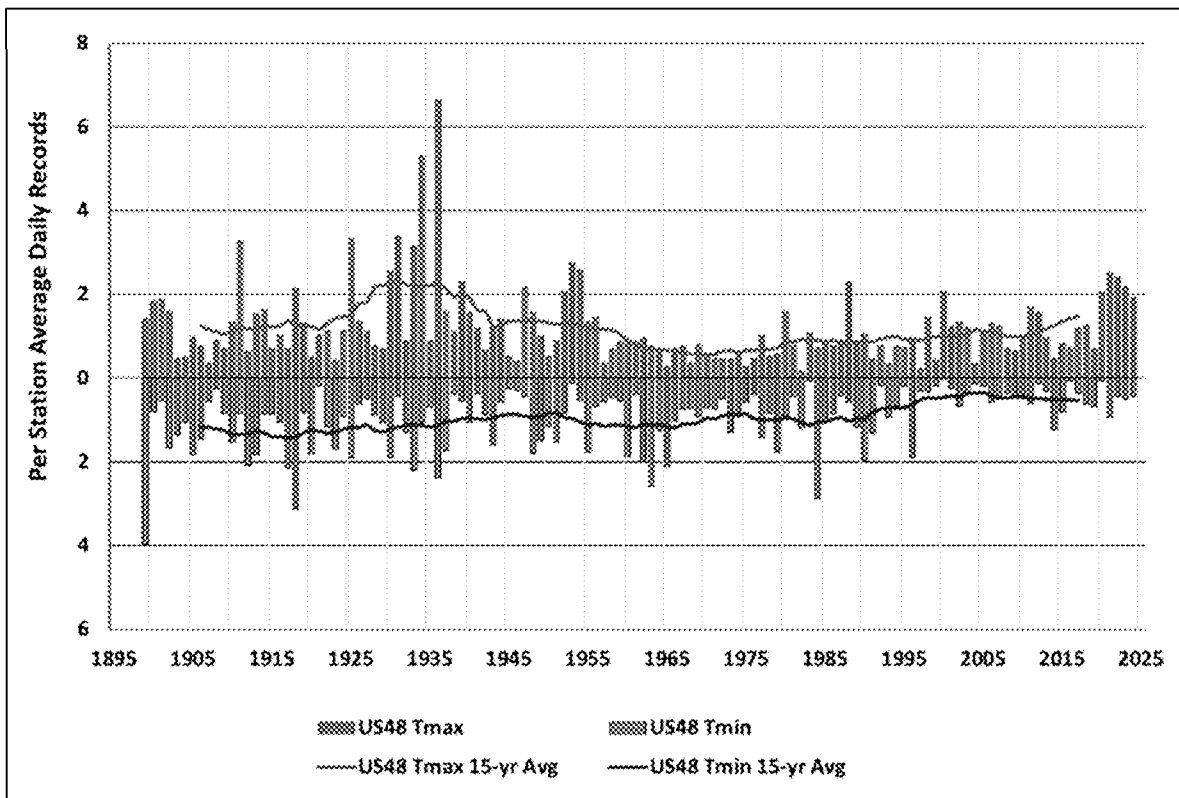


The figure appears to validate the claim that record warm daily temperatures are occurring more often. But the underlying data do not. Rather, they show that extreme heat in the U.S. peaked in the 1920s and 1930s and declined thereafter, as supported by Figure 6.4 deep within the CSSR itself (reproduced in our Section 4.2 below).

Figure ES.5 does not even show what its title implies, as it displays not simple counts of cold and warm extreme events, but rather ratios of the two counts. In fact, both types of extremes declined over the sample interval, but cold events declined more than warm events, so the ratio of warm extremes to cold extremes increased. By graphing the ratio instead of counts, NCA4 creates a visual impression opposite to what is in the data.

Figure 6.3.3 of CWG25 (reproduced below) shows the results of a proper analysis of the data – defining each record as the singular extreme in the sample interval, displaying numbers of warm and cold records separately, and beginning the analysis in 1899 rather than 1930. It makes evident the exceptional heat of the 1920s and especially the 1930s, peaking in 1936.³ The frequency of cold records has declined, especially over the last quarter of the period in which only 13 percent of the extreme cold events were measured. In contrast, 25 percent of the heat records were achieved in the last quarter, which is consistent with statistical expectations. As a result, the ratio of heat to cold extremes shown in Figure ES.5 of the CSSR explodes in recent decades. The overall reduction in numbers of both cold and hot extremes over the past century indicates a climate *less* prone to extremes, in sharp contrast to the message of NCA4 Figure ES.5.

³ The increased heat of the past five years is too brief to be deemed climatically significant and, in any event, occurred after the CSSR was published in 2017.



Number of daily record High (red) and Low (blue) temperatures for warm and cold seasons in the CONUS. The lines represent the 15-year running, centered average. Source: 1,211 USHCN stations supplemented as needed to achieve a minimum of 92 percent of observations in the 126-year period since Dec 1898. US48: contiguous U.S. states. Tmax: maximum temperature. Tmin: minimum temperature. Source: CWG25 Figure 6.3.3.

The National Academies' expert review panel criticized the discussion of temperature extremes in a late draft of the CSSR. In reference to the CSSR's Key Finding 2 of Chapter 6, they said:

Further, it is difficult to understand how a statement that includes increases in extreme warmth can be associated with a high confidence or extremely likely statement, given that most of the graphics in this chapter show a decrease in extreme warmth in the historical record.

The Federal official in charge of the CSSR (Michael Kuperberg, Executive Director of the USGCRP) responded to the Academies' review by noting that

Almost every recommendation from the NAS was incorporated [in the final version]... and a new figure was added on changes in record high and low temperatures

The "new figure" referred to is the Figure ES.5, which did not appear in the draft reviewed by the Academies' panel. It seems unlikely that the Academies panel ever saw that figure because they

surely would have commented if they had and it wouldn't have survived to publication. And the figure's problems were evidently not flagged (or were ignored) in the subsequent internal government reviews.

With this background we now present our critique of NCA5.

2 NCA5 OVERVIEW CHAPTER: HYPERBOLIC ADVOCACY LANGUAGE AND UNSCIENTIFIC TONE

[Fix formatting in "UNSCIENTIFIC"]

NCA5 Chapter 1, "Overview", holds a prominent place in the Report since it summarizes the entire whole report and is the only section that many will read. Although the later chapters of NCA5 contain much sound scholarly content, Chapter 1 is marred by an activist tone and language that aggressively promotes mitigation policies. As such, this chapter adds an imprimatur of scientific authority to oversimplified declarations of opinion about public policy. Many examples can be cited; here we note a few that are particularly egregious.

Chapter 1 opens as follows:

The more the planet warms, the greater the impacts. Without rapid and deep reductions in global greenhouse gas emissions from human activities, the risks of accelerating sea level rise, intensifying extreme weather, and other harmful climate impacts will continue to grow. Each additional increment of warming is expected to lead to more damage and greater economic losses compared to previous increments of warming, while the risk of catastrophic or unforeseen consequences also increases.

This statement presupposes that all warming is anthropogenic, that all warming is bad and causes economic damage, and that warming intensifies extreme weather. Such sweeping generalizations go well beyond what science has or can establish. The statement also refers to growing risks without saying whether they were large to begin with -- a small risk that grows may still be a small risk, and a large risk may be only incrementally worsened. A scientifically-sound version of this paragraph would instead say something like the following:

The Earth is warming because of a combination of natural and anthropogenic influences. This warming will generate a mix of benefits and harms that varies by region, to which society should be prepared to adapt. Some types of extreme weather have worsened recently, while others have not changed or have even declined in intensity. Reducing emissions of greenhouse gases might slow the warming although such policies have proven to be costly and disruptive, so any climate actions to be weighed against the potential benefits.

On the next page the Overview states ~~goes on to say~~:

Each additional increment of warming leads to greater risks [here it lists 7 key components of society including food security and the economy]... Without deeper cuts in global net emissions, climate risks to the US will continue to grow... Action to limit future warming and reduce risks can have near-term benefits and opportunities: low-carbon energy jobs, Improved air quality, Health benefits, Economic benefits..."

The authors write as if climate policy does not involve trade-offs and all measures to reduce future warming will be effective and beneficial. But the vast body of scholarship on climate science and economics does not support such simplistic claims. Not every additional increment of warming leads to economic harms; in fact, NCA5 Chapter 19 acknowledges that there will also be benefits. Nor is

climate policy guaranteed to create jobs or benefit the economy; in many cases it has done the opposite. Such deceit is a disservice to policymakers.

Pages 8 and 9 of the Overview promote renewable energy options by noting, correctly, that the leveled costs of wind/solar generation have fallen sharply since 2010, and so offers this rationale for pursuing deep emission reductions:

Recent growth in the capacities of wind, solar, and battery storage technologies is supported by rapidly falling costs of zero- and low-carbon energy technologies, which can support even deeper emissions reductions. For example, wind and solar energy costs dropped 70% and 90%, respectively, over the last decade, while 80% of new generation capacity in 2020 came from renewable sources.

Yet it has long been known that intermittent renewables generation must be supplemented by dispatchable generation to meet grid reliability standards, and that doing so (e.g., through natural gas, fission, or storage) significantly increases the cost of electricity. Further, there are yet unmet synchronization challenges in transmission grids with heavy penetration of wind and solar power. Here again it is advisory malpractice not to acknowledge these facts.

Page 14 of the Overview presents future emission scenarios with the following description: “Climate modeling experts develop global climate projections for a range of plausible futures.” The word “plausible” is applied to all of the scenarios. The accompanying Figure includes both SSP3-7.0 and SSP5-8.5, the latter reaching the same radiative forcing as RCP8.5. The Figure does not compare observed emissions with previous projections nor does it caution readers that SSP3-7.0 and SSP5-8.5 are extreme worst case scenarios that, like RCP8.5, have been heavily criticized in the scientific literature (CWG25 3.2.1). By describing the entire envelope of emission projections as “plausible” the report opens the door to later presenting impacts associated with extreme and implausible emission scenarios as part of a baseline “business-as-usual” future.

Page 17 of the Overview introduces the discussion of risks from extreme weather events by saying “Harmful impacts from more frequent and severe extremes are increasing across the country.” This creates the impression that disaster losses are driven by trends in extreme weather. While the section goes on to acknowledge that some of the increase is due to increases in the value of assets at risk it then invokes the NOAA Billion Dollar Dataset as evidence of extreme weather getting worse. Scientists have shown that this is an invalid metric (CWG 10.2) since it measures the growth of the economy not the frequency of extreme weather, and indeed NOAA has recently withdrawn the data product. REFERENCE PIELKE JR PAPER Even though it was still distributed by NOAA at the time of the NCA5, the report authors should have assessed it skeptically and seen that it was unfit for the purpose of measuring climate trends.

Page 23 of the Overview states, in large font:

Climate changes are making it harder to maintain safe homes and healthy families; reliable public services; a sustainable economy; thriving ecosystems, cultures, and traditions; and strong communities.

It is pointless to try to evaluate this statement on scholarly grounds; it is self-evidently hyperbolic. This kind of language doesn’t belong in a scientific assessment report. Its prominent inclusion points not only to the willingness of NCA5 authors to promote alarm, but also the ineffectiveness of the review process in not ensuring such statements are removed.

The tone of the Overview chapter hints at the priorities that governed the writing of the entire report. Word counts of the full report are another crude indicator of those priorities

Term	Number of occurrences
Forcing	111
Uncertainty	384
Watts	19
Culture/culturally	854
Equity/equitable	572
Indigenous	890
Sustainable	295
Racism/racial	153

3 OVERCONFIDENCE WHEN STATING CONCLUSIONS

3.1 Inflated certainty levels

Overconfidence in stating conclusions is an endemic problem in NCA5. The authors frequently make sweeping generalizations without appropriate caveats or acknowledging uncertainties. The overconfidence begins with inflated language to describe certainty levels.

NCA5 uses specific terms to convey information about scientific confidence associated with important finds, observations and projections. The Front Matter of NCA5 states that

confidence in a finding is based on the type, amount, quality, strength, and consistency of evidence; the skill, range, and consistency of methods to detect, evaluate, attribute, and interpret climate trends; and the degree of agreement across scientific information sources.

and Table 1 from the Front Matter provides calibrated language for confidence assessment:

Very high:	Strong evidence (established theory, multiple sources, well documented and accepted methods, etc.). High consensus
High:	Moderate evidence (several sources, some consistency, methods vary and/or documentation limited, etc.). Medium consensus
Medium:	Suggestive evidence (a few sources, limited consistency, methods emerging, etc.) Competing schools of thought.
Low:	Inconclusive evidence (limited sources, extrapolations, inconsistent findings, poor documentation and/or methods not tested, etc.). Disagreement or lack of opinions among experts.

This terminology is inflated: *high confidence* with just moderate evidence and medium consensus; *medium confidence* with only suggestive evidence and competing schools of thought. This inflation in terminology leads to overconfidence in conclusions.

Even with this inflated terminology, NCA5 further inflates the confidence level of many of its conclusions to well beyond what the IPCC has concluded with more thorough justification, and also by incorrectly applying its own standards. Here are two examples.

Key Message 3.1 Traceable Account states:

There is *very high confidence* that emissions of GHGs from human activities, fossil fuel use in particular, have unequivocally caused *all* global warming observed over the industrial era.

while the corresponding statements from IPCC AR5 and AR6 are

AR5: It is *extremely likely* that *more than half* of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic increase in greenhouse gas concentrations and other anthropogenic forcings together.” (IPCC, 2013)

AR6: The *likely* range of total human-caused global surface temperature increase from 1850–1900 to 2010–2019 is 0.8°C to 1.3°C, with a best estimate of 1.07°C. It is *likely* that well-mixed GHGs contributed a warming of 1.0°C to 2.0°C, other human drivers (principally aerosols) contributed a cooling of 0.0°C to 0.8°C, natural drivers changed global surface temperature by –0.1°C to +0.1°C, and internal variability changed it by –0.2°C to +0.2°C. It is *very likely* that well-mixed GHGs were the main driver of tropospheric warming since 1979.

The IPCC AR5 and AR6 statements provide likelihood assessments but not a confidence level. While NCA5 claims with *very high confidence* that fossil fuels have unequivocally caused *all* global warming, AR5 refers to “*more than half* of the observed warming” and AR6 provides a more nuanced statement that relates to a *likely* range of warming contributed to by human drivers.

As a second example, NCA5 Key message 2.2 reads

~~Hurricanes have been intensifying more rapidly since the 1980s (*high confidence*) and causing heavier rainfall and higher storm surges (*high confidence*).~~

~~No justification is provided in Chapter 2 for the *high confidence* conclusion on higher storm surges or hurricanes causing heavier precipitation. The Traceable Accounts section, Description of Confidence and Likelihood states:~~

~~Basic physical understanding and climate models both provide robust explanations for the links between climate change and observed changes in these extremes; this is why the authors also have *high confidence* that storms are delivering more rainfall and high confidence that storm surges are becoming higher.~~

~~In short, NCA5 provides no observational basis or published research for their *high confidence* assertions that hurricanes are causing heavier rainfall and higher storm surges, thus failing to meet its own standards for a *high confidence level*.~~

~~THIS EXAMPLE IS USED IN TRACEABLE ACCOUNTS~~

3.2 Overstating findings in underlying sources

Although we did not do a detailed audit of NCA5's use of source material, spot checks turned up evidence of a pattern of overstatement.

Chapter 2 page 11 reports on an increase in precipitation in some areas and attributes it to human caused climate change:

Many eastern regions of the country are getting wetter (Figure 2.4). Average annual precipitation from 2002-2021 was 5%-15% higher relative to the 1901-1960 average in the central and eastern US, a trend attributable to climate change.⁴

Note that this a non-standard metric; we will discuss NCA5's inconsistent choices of time scales of analysis below. The claims were attributed to the following paper:

- Knutson, Thomas and Fanrong Zeng (2018) "Model Assessment of Observed Precipitation Trends over Land Regions: Detectable Human Influences and Possible Low Bias in Model Trends" *Journal of Climate* 31(12)
<https://journals.ametsoc.org/view/journals/clim/31/12/jcli-d-17-0672.1.xml>

But Knutson and Zeng did not say these things. They examined linear trends over 1901 – 2010, 1951 – 2010 and 1981 – 2010. They did not compare average rainfall over 2002 - 2021 to average rainfall over 1901 – 1960, if only because their study was published in 2018. For 1981-2010, they noted stronger trends in some areas but cautioned that such changes are consistent with natural variability, and they did not claim attributable trends were observed over the United States:

Observed annual precipitation trends over the recent 30-yr period 1981–2010 (Fig. 5) have generally stronger magnitudes (in mm yr⁻¹ decade⁻¹) than observed trends for 1901–2010 or 1951–2010. This is as expected since trends over a shorter period have stronger potential for occurrence of pronounced temporary trends due to internal variability alone. Only 9% of the analyzed area has detectable and attributable anthropogenic influence (categories -3, -2, +2, +3), which represents less than one-third of the fractional areal coverage of such trends for 1901–2010 (29%). ... Eight percent of the analyzed area has attributable anthropogenic *increases* (categories +2, +3), including parts of eastern Europe, northern Asia, northern Australia/Maritime Continent, and tropical Africa.

As another example of overstating findings, NCA5's Chapter 2 page 18 states

There is robust evidence that human-caused warming has contributed to increases in the frequency and severity of the heaviest precipitation events across nearly 70% of the US.

This is allegedly attributed to two papers:

- Diffenbaugh, N.S., D. Singh, and J.S. Mankin, 2018: Unprecedented climate events: Historical changes, aspirational targets, and national commitments. *Science Advances*, 4 (2), 3354.
<https://doi.org/10.1126/sciadv.aao3354>

⁴ Quite separately we note that the attribution to "climate change" is misleadingly ambiguous. Because NCA5's Glossary defines "climate change" as a change in climate for any reason, the statement is a tautology and so the attribution is superfluous. But because the popular perception of climate change is anthropogenic, its gratuitous inclusion effectively attributes the changes to greenhouse gas emissions. [FIX FORMATTING HERE]

- Kirchmeier-Young, M.C. and X. Zhang, 2020: Human influence has intensified extreme precipitation in North America. *Proceedings of the National Academy of Sciences of the United States of America*, **117** (24), 13308-13313. <https://doi.org/10.1073/pnas.1921628117>

Diffenbaugh *et al.* presented ratios of observed occurrences of extreme events to simulated occurrence rates in CMIP6 models run with only natural forcings. They report that for 79% of the U.S. extreme rainfall event frequencies are currently higher than in model simulations, and the ratio of occurrences will rise under future warming simulations. This is not “robust” evidence of anthropogenic influence since it requires readers to assume that climate models provide accurate simulations of regional precipitation patterns, something that even IPCC AR6 admits is uncertain (AR6 WGI SPM Box SPM 1.2, SPM Section C.1.3).

Kirchmeier-Young and Zhang looked at extreme 1- and 5-day events in North America and, using three GCMs, found

A signal of combined anthropogenic and natural external forcing can be detected in the intensification of extreme precipitation at the continental scale over North America. In some cases, this intensification can be attributed to human influence specifically.”

However, they noted large differences among the three models in their simulated precipitation changes. Also, two of the three models failed to yield attribution for 5-day events for the North America mean. In other words the models disagreed on whether the observed changes were due to anthropogenic activity. Both cited references utilized the implausible RCP8.5 scenario and began their “historical” observational records only in 1961. Here again this is not “robust” evidence, it is merely suggestive, particularly since other studies have found natural variability predominant.

3.3 Technical example: Emergent constraints

Some of the overconfidence expressed by NCA5 arises by omitting discussion of counterevidence in the peer reviewed literature. An example is the topic of “emergent constraints”. Chapter 3 page 17 invokes this concept to support its claim that key uncertainties have been reduced:

An approach to reduce uncertainty in climate change projections has matured over the past decade. It is known as “emergent constraints.” The term refers to strong statistical relationships between highly uncertain future climate parameters and observable trends or variations in the current climate, along with a physical explanation of this relationship.

Emergent constraints appeared in the climate modeling literature as an attempt to tie GCM behavior to climate observations in hopes of generating insight into real-world ECS equilibrium climate sensitivity to a doubling of carbon dioxide (ECS). Climate models exhibit a wide range of sensitivities ECS values. The idea of emergent constraints is to examine whether the models with shared sensitivity values also share a common representation of some climate process (usually related to clouds) that might indirectly influence ECS. Suppose, for instance, that in low-ECS models the total cloud fraction in the tropics is strongly correlated with that in the southern midlatitudes but in high-ECS models the correlation is weak. Then researchers could examine whether check if the observed correlation is strong or weak and draw a conclusion about which type of model, and therefore which ECS value, is more likely.

A problem in the emergent constraint literature is that there has been a proliferation of proposed correlations with little physical motivation. Many emergent constraints patterned on CMIP5 models failed to work on CMIP6 models (Schlund *et al.* 2020)⁵. In other words, the observed correlations in CMIP5 models between ECS and cloud processes failed to show up in CMIP6 models, indicating that they were likely spurious rather than clues to physical processes governing the Earth climate system. The result was that emergent constraints estimated from CMIP5 models widened the range of estimated ECS values when applied to CMIP6 models.

Schlund *et al.* summarized the problem as follows [**boldface** used for emphasis]

In this study, we systematically analyze 11 published emergent constraints on ECS that have mostly been derived from models participating in the Coupled Model Intercomparison Project Phase 5 (CMIP5) project... The focus of the study is on testing if these emergent constraints hold for [Earth System Models] participating in the new Phase 6 (CMIP6). Since none of the emergent constraints considered here have been derived using the CMIP6 ensemble, CMIP6 can be used for cross-checking of the emergent constraints on a new model ensemble. **The application of the emergent constraints to CMIP6 data shows a decrease in skill and statistical significance of the emergent relationship for nearly all constraints, with this decrease being large in many cases.** Consequently, the size of the constrained ECS ranges (66% confidence intervals) widens by 51% on average in CMIP6 compared to CMIP5.

Yet NCA5 described the use of emergent constraint analysis as a great “advance” that reduced uncertainty.

⁵ Schlund, Manuel, Axel Lauer, Pierre Gentine, Steven C. Sherwood, and Veronika Eyring (2020) Emergent constraints on equilibrium climate sensitivity in CMIP5: do they hold for CMIP6? *Earth System Dynamics* 11 1233-1258 <https://doi.org/10.5194/esd-11-1233-2020> [Need to be consistent on where references go]

4 RELIANCE ON *Ad Hoc* TIME SCALES FOR TREND ANALYSIS

In CWG25 Chapter 6 we discussed the need for care in the choice of time scale when making claims about trends in extreme weather. We gave provided examples from analysis of river flooding {6.1}, heatwaves {6.3}, and extreme precipitation {6.4} to show how assertions about apparent trends based on short data sets fall apart when looking at longer versions of the same data sets. Here we elaborate on these examples to illustrate the general point that NCA5 made inconsistent and *ad hoc* choices about time scales of analysis, weakening the validity of their conclusions.

McKittrick and Christy (2019)⁶ CWG25 Section 6.x showed that apparently significant positive trends in U.S. average and extreme precipitation over the NCA4 interval (1901 – 2016) disappeared on longer samples (extending back as far as the 1840s, depending on location) or on a shorter interval coinciding with the final 40 years of the data then available (1978 – 2017).

In CWG Section 6.4 we presented analyses of updated data for the same locations (and many others), in all cases finding both considerable regional heterogeneity and that trends detectable on one time scale are often not detected on longer or shorter time scales. These findings argue against simple attribution of changes to anthropogenic influences.

4.1 Average and Extreme Precipitation

Under Key Message 2.2 “Extreme Events Are Becoming More Frequent and Severe” (p. 2-16) NCA5 states (p. 2-18):

Rainfall is becoming more extreme

Since the 1950s, there has been an upward trend in heavy precipitation across the contiguous US. This increase is driven largely by more frequent precipitation extremes, with relatively smaller changes in their intensity.

NCA5 did not continue the NCA4 precedent of using the post-1901 interval as the time scale for its precipitation discussion; instead it refers to changes “since the 1950s”; NCA5 Figure 2.8 suggests 1958 as the start date. For the present report we have extended the CWG25 analysis even further to include 141 stations across the US in the Pacific Coast, Midwest, Northeast and Southeast regions. We provide details in Appendix 3; here we note merely that once again it is possible to find trends that support the NCA5 position, but they are not robust to selecting longer or shorter time scales of analysis. Data from 1950 to 2024 yields many indications of increased average and extreme precipitation at individual stations and region-wide averages. But when using the entire data set (back to the 1890s or earlier, depending on location) or the later subset (1980 to 2024) the trends become smaller, in many cases they become statistically insignificant, and occasionally they even change sign. Only in the Northeast region are the post-1950 trends robust to also focusing on trends during the post-1980 interval.

The following is a more accurate summary of what U.S. data show.

⁶ McKittrick, R., and J.R. Christy (2019). Assessing changes in US regional precipitation on multiple time scales. *Journal of Hydrology*, 578, 124074. <https://doi.org/10.1016/j.jhydrol.2019.124074>

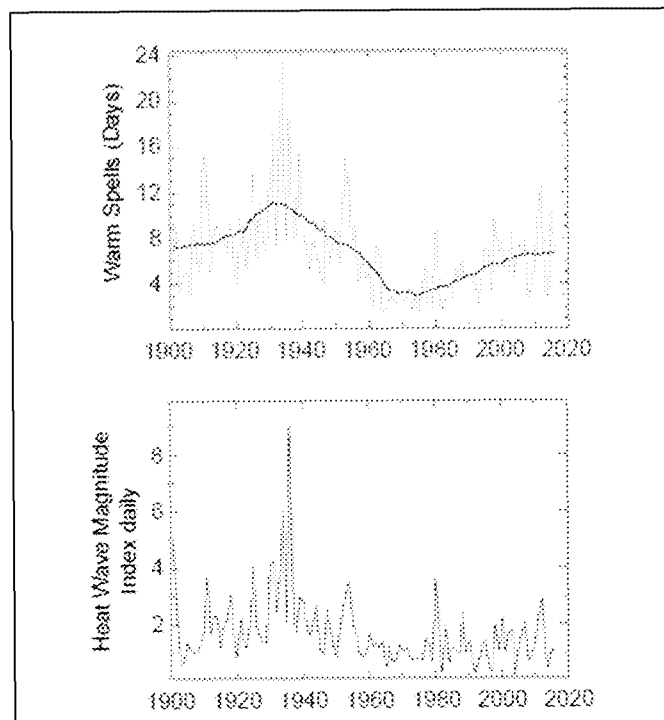
There are regionally heterogeneous changes in average and extreme precipitation. Positive trends in annual average rainfall and extreme events (defined either as the annual maximum or the number of exceedances of the 99th percentile value) are generally weak or non-existent when looking at samples exceeding 130 years in length. Significant trends can be found when beginning the sample in the 1950s although in most cases the trends weaken and become insignificant when looking at the post-1980 interval. This makes attribution of changes in precipitation to anthropogenic warming difficult.

4.2 Heatwaves

In contrast to NCA5, NCA4 examined heat extremes across the whole of the entire 20th century, pointing out that peak heat wave activity was reached in the 1930s and has decreased since then, and that recent increases are confined to areas west of the Rockies:

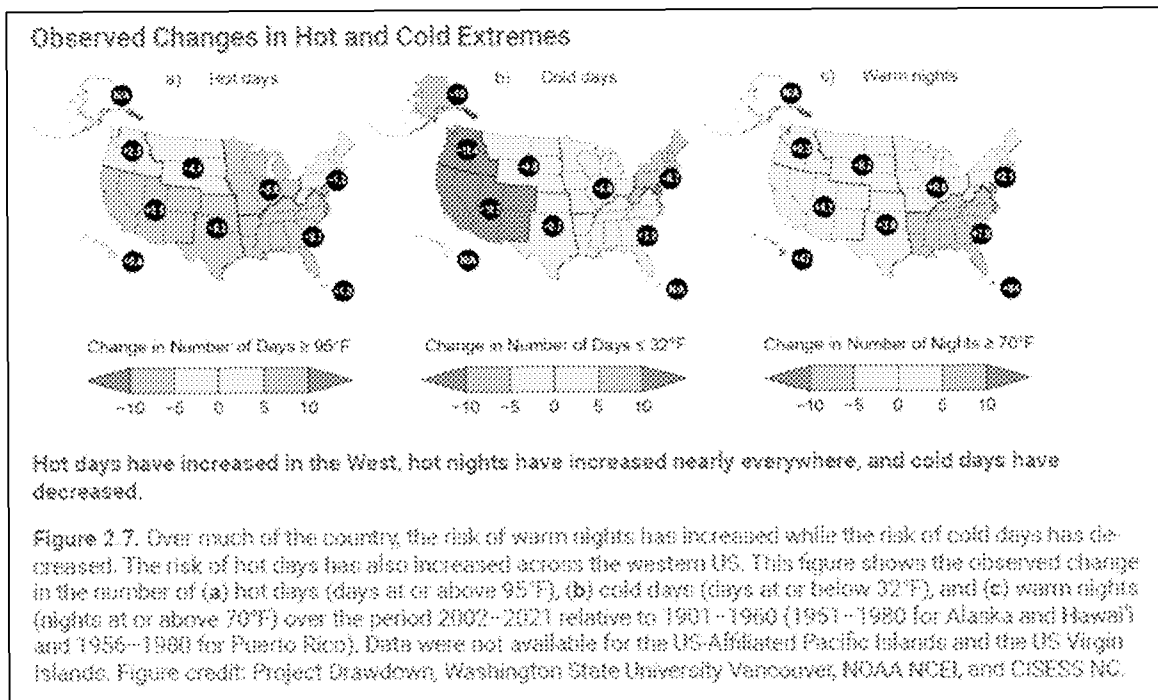
[The] warmest daily temperature of the year increased in some parts of the West over the past century, but there were decreases in almost all locations east of the Rocky Mountains. In fact, all eastern regions experienced a net decrease, most notably the Midwest (about 2.2°F [1.2°C]) and the Southeast (roughly 1.5°F [0.8°C]).

Since the mid-1960s, there has been only a very slight increase in the warmest daily temperature of the year (amidst large interannual variability). Heat waves (6-day periods with a maximum temperature above the 90th percentile for 1961–1990) increased in frequency until the mid-1930s, became considerably less common through the mid-1960s, and increased in frequency again thereafter. As with warm daily temperatures, heat wave magnitude reached a maximum in the 1930s. (NCA4 pp. 190-191)



U.S. Heat waves since 1900. Source: NCA4 Figure 6.4

Contrast this careful and factual language with NCA5 Key Message 2.2: “Extreme Events Are Becoming More Frequent and Severe.” This blanket statement is followed by NCA5 Figure 2.7 (reproduced below) which shows the number of hot days, cold days and warm nights (respectively in panels a—c) over the period 2002–2021 compared to 1901–1960. [Presumably these are annual counts, although not stated in the caption.]



Close inspection shows that this figure contradicts the NCA5 Key Message with respect to heatwaves and instead reinforces the position of NCA4. Notwithstanding Key Message 2.2 the leftmost panel in Figure 2.7 above shows that over most of CONUS the number of extreme heat days has decreased in recent decades compared to the prior century.

The accompanying discussion in NCA5 becomes convoluted as it appears to be aimed at supporting the Key Message despite the contrary evidence. NCA5 chapter 2 elaborates on Key Message 2.2 by saying (page 16):

Observations show an increase in the severity, extent, and/or frequency of multiple types of extreme events. Heatwaves have become more common and severe in the West since the 1980s (*high confidence*).

But it fails to mention WHAT DECLINE the decline elsewhere. Instead, it says on the next page (page 17): THIS POINT IS UNCLEAR

By some measures, the most extreme heatwaves on record in the United States occurred during the Dust Bowl era of the 1930s. ... Globally such heatwaves are becoming more frequent, and in recent decades the western United States has been following those trends.

The reference to a global trend seems to be an attempt to tie heatwaves to climate change. But the obvious question, unaddressed by NCA5, is why ~~it~~WHAT?? holds for only part of the U.S. while most of the country is trending in the opposite direction. These issues are addressed in Chapter 6 of CWG25, demonstrating that the range and magnitude of extreme temperatures (10s of degrees) are driven more by natural variability than by the small anthropogenic forcing. The analysis in CWG25 shows that for both (a) hot days ($\geq 95^{\circ}\text{F}$) and (b) number of days in heatwaves, the current decade is no hotter than a century ago. For example, during the 30-year period 1925-1954 (only 23% of the 1899-2024 data record), CONUS experienced 33% of the total heat wave days and during the most recent 30 years it experienced 24%, almost exactly that expected by chance. Thus, the NCA5 claim that “multiday heatwaves have become hotter, more frequent, larger, and longer lasting in recent decades,” is simply false when expanding the temporal and spatial domains to encompass all available data (Chapter 6 and Figure 6.3.6 of CWG25).

NCA5 then pointed to the dramatic Pacific Northwest heatwave of 2021. CWG2025 Section 8.6.1 discussed this event in detail, reviewing the multiple peer reviewed studies that explained the unusual meteorological context was unrelated to human-caused climate change, a point omitted from the NCA5 discussion.

NCA5 finally ~~turns to~~ addresses the declining heatwave trend in CONUS east of the Rockies but attempts to reframe it by focusing on urban warm spells.

[The] number of very hot days has actually decreased across the central and eastern regions due to summer cooling trends in the region (Figure 2.7; Ch. 22). This does not, however, mean the central and eastern US are not affected by heat. The impacts of extreme high temperatures are more severe if such conditions persist for several days, and overall, multiday heatwaves have become hotter, more frequent, larger, and longer lasting in recent decades. Across 50 large US cities, the US Global Change Research Program heatwave indicator (<https://www.globalchange.gov/indicators/heat-waves>) shows that the average number of heatwaves has doubled since the 1980s, and the length of the heatwave season has increased from about 40 days to about 70 days.

We discussed ~~this issue~~ WHAT ISSUE in CWG25 Section 6.3. The figure referenced by NCA5 uses an *ad hoc* definition of heat wave, namely two consecutive days with minimum nighttime temperatures above the 85th percentile, and an *ad hoc* time scale which begins in the 1960s, the coldest decade in the last century, thus suppressing any comparison to the 1930s. Further, nighttime temperatures in urban areas have ~~gone up~~ increased faster than daytime temperatures (which NCA5 acknowledges), but this is a signature of urban heat islands and not a good metric of climate change. CWG25 noted as well that the occurrence of hot days ($\geq 95^{\circ}\text{F}$) has recently increased in the West, but declined in the remainder of the country, and in the nationwide average, since 1899.

5 INADEQUATE TRACEABLE ACCOUNTS

NCA3 began the practice of including a section on Traceable Accounts at the end of each chapter. This is the description from NCA5:

Each chapter concludes with a section entitled Traceable Accounts, which provides information on the overall process used to develop the chapter as well as a separate Traceable Account section for each Key Message. These Traceable Accounts describe the supporting evidence behind each Key Message, the process and rationale authors used in reaching their conclusions, and the author team's expert assessment of the confidence in and, where applicable, likelihood of these conclusions. As such, Traceable Accounts provide information about the state of the science, document sources of uncertainty, identify research gaps, and allow traceability to data and resources.

The Traceable Accounts for each chapter and Key Message includes the following sections:

- Description of Evidence Base
- Major Uncertainties and Research Gaps
- Description of Confidence and Likelihood

The Traceable Accounts could in principle address the statutory requirement that the NCA discuss scientific uncertainties. They could also help satisfy the Executive Order for Restoring Gold Standard Science by addressing reproducibility, transparency, communication of error and uncertainty, and skepticism of findings and assumptions. However, the Traceable Accounts in NCA5's Chapters 2 and 3 (the only chapters investigated here) are uneven, often superficial and noninformative.

An example of a deficient Traceable Account is NCA5's Key Message 2.2: "Extreme Events are Becoming More Frequent and Severe". The "Description of the Evidence Base" offers two paragraphs, the first summarizing the findings and the second generically describing the types of data that can be used for storms. "Major Uncertainties and Research Gaps" focuses on the uneven distribution across U.S. populations due to differences in exposure and vulnerability. The only limitations in data referred to are the lack of a long-term record of lightning and the lack of homogenized daily and hourly temperature data apart from reanalysis products.

But the most astonishing deficiency is in the "Description of Confidence and Likelihood." One of the statements in Key Message 2.2 is:

Hurricanes have been intensifying more rapidly since the 1980s (high confidence) and causing heavier rainfall and higher storm surges (high confidence).

The Description of Confidence and Likelihood includes the following statement:

Basic physical understanding and climate models both provide robust explanations for the links between climate change and observed changes in these extremes: this is why the authors also have high confidence that storms are delivering more rainfall and high confidence that storm surges are becoming higher.

No reference to journal publications or a specific data set is made in the Chapter regarding hurricane induced precipitation or storm surge to support this *high confidence* conclusion.

The Traceable Accounts for the various Key Findings of Chapter 3 have some substantial inconsistencies. Consider

Key Message 3-1: Human activities have caused global warming.

Confidence and Likelihood: “There is *very high confidence* that emissions of GHGs from human activities, fossil fuel use in particular, have *unequivocally* caused all global warming observed over the industrial era. There is also *very high confidence* that changes in natural climate drivers have had globally small and regionally variable long-term effects over this period.”

The Uncertainties section addresses only uncertainties in radiative forcing by greenhouse gases. In contrast, the Traceability Analysis of Key Message 3-4 (“Humans Are Changing Earth System Processes”) is arguably the most scientifically credible text in the entire Chapter. From its Description of Evidence Base:

In the last decade, there has been increasing recognition of the role of regional-scale natural variability in the past and future evolution of climate, as well as the fact that regional natural variability signals can be competitive with forced anthropogenic signals.

And from its Major Uncertainties and Research Gaps:

For example, the true natural variability of the climate system on decadal to centennial timescales could be larger than what we estimate from GCMs, which would further increase the irreducible uncertainty stemming from natural variability.

There is also a generic problem in tracing NCA5’s Traceable Accounts. The Front Matter of NCA5 states:

Each figure and some tables are accompanied by a metadata survey, which can be accessed in the online version of the report by clicking on the eyeball icon above the figure or table (see the table below for explanations of additional icons used throughout the report). The metadata survey describes data sources, figure or table development methods, copyright information, and other important documentation.

Upon clicking on the eyeball icon above a particular figure, a “Contact Us” email appears, addressed to the USGCRP. No attempt was made to send a email to elicit the Metadata information, but it is clear that this information is not readily accessible online.

In summary, the Traceable Analyses examined here, with few exceptions, fail to meet the stated objectives set forward by the NCA.

6 OVEREMPHASIS ON EXTREME SCENARIOS

To respond to the GCRA mandate to “project major trends for the subsequent 25 to 100 years,” NCA5 relies on projections of future climate change based on estimates of future emissions (the so-called SSP scenarios) and/or specified levels of radiative forcing (the RCP scenarios). For the most part, NCA5 uses scenarios developed for the IPCC Assessment Reports.

In CWG Section 3.2.1 we presented a critical assessment of past and current IPCC scenario envelopes, showing that they have tended to overshoot observed emissions. The IPCC AR6 published in 2021 stated that “The likelihood of high-emission scenarios like RCP8.5 and SSP5-8.5 is considered low in light of recent energy sector developments.” and that same year UN Climate Negotiators (COP) stopped using scenarios above 4.5.

NCA5 makes the following observations about the scenarios they use:

NCA5 authors were advised to assess the full range of scenarios available. (Front Matter)

Scenarios of future emissions and land-use change are developed as plausible alternatives, but no relative likelihood is attached to them. Some recent studies, however, have argued that the highest scenario, SSP5-8.5, is no longer plausible without a reversal of current trends in the adoption of renewables and energy efficiency. (Key Message 3.3 Traceable Analysis)

Despite acknowledging the issue, NCA5 otherwise ignored the problem. A keyword search of NCA5 of mentions of RCP/SSP scenarios finds over 50% referred to the extreme emissions scenarios RCP8.5/SSP5-8.5. Further, 10 NCA5 figures (5.2, 6.9, 7.4, 11.3, 14.6, 22.13, 22.19, 27.9, 29.13) included *only* the 8.5 scenarios:.

The problem of relying on extreme scenarios is particularly acute for NCA5’s sea level rise projections. The sea level rise scenarios used in NCA5 do not relate directly to the SSP emissions scenarios, but rather to specified amounts of sea level rise by 2100. Table 4 of NCA5’s “Guide to Using this Report” reproduced below shows that Low relates to 0.3 m (0.98 feet), Intermediate-Low relates to 0.5 m (1.64 feet), Intermediate relates to 1.0 m (3.28 feet), Intermediate-High relates to 1.5 m (4.92 feet), and High relates to 2.0 m (6.56 feet).

Table 4. Descriptive Terms for Common Sea Level Rise Scenarios Used in NCA5						
Future global mean sea level rise and sea level rise along United States coastline are shown for five scenarios in feet (and meters), relative to a 2000 baseline. The US values shown in the right half of the table are averaged across the US coastal regions, including the contiguous US, Alaska, Hawaii and the US-Affiliated Pacific Islands, and the US Caribbean. The national values shown in the table differ substantially from regional values. For example, sea level rise is higher in the Gulf Coast and lower or even negative in some parts of Alaska. In the next 30 years (2020–2050), sea level along the contiguous US coasts is expected to rise 0.92 feet (0.28 m), the same amount of sea level rise observed over the last 100 years (1920–2020). See Chapter 9 for regional sea level information. Adapted from Sweet et al. 2022. ¹						
Sea Level Rise Scenario Descriptors	Global Mean Sea Level			United States		
Year	2050	2100	2150	2050	2100	2150
Low	0.49 (0.15)	0.98 (0.3)	1.31 (0.4)	0.59 (0.18)	0.98 (0.3)	1.64 (0.5)
Intermediate-Low	0.66 (0.20)	1.64 (0.5)	2.62 (0.8)	0.75 (0.23)	1.64 (0.5)	2.95 (0.9)
Intermediate	0.92 (0.28)	3.28 (1.0)	6.23 (1.9)	0.89 (0.27)	3.28 (1.0)	6.89 (2.1)
Intermediate-High	1.21 (0.37)	4.92 (1.5)	8.86 (2.7)	1.12 (0.34)	4.92 (1.5)	8.86 (2.7)
High	1.41 (0.43)	6.56 (2.0)	12.14 (3.7)	1.38 (0.42)	6.56 (2.0)	12.46 (3.8)

Table 4 from the Front Matter of NCA5

Considering only projections representing processes quantified with at least medium confidence, IPCC AR6 assessed global mean sea level projections for 2100 to fall between 0.2 and 1.6 m (5th—95th percentile range). Nevertheless, the range of sea level rise scenarios considered by NCA5 extends to 2.0 m. Further, NCA5 fails to include plausible lower scenarios, such as 0.2 m cited by the IPCC, which also corresponds to the average rate of sea level rise over the past century.

Chapter 9 of NCA5 offers the following predictions of sea level rise:

“Under a range of potential global warming levels, average sea level along US coastlines is *likely* to be between 12 and 20 inches above 2000 sea levels in 2050 (Figure 9.2).”

These values span from the Intermediate scenario to values slightly greater than the High scenario. They can be put into context by considering the observed global sea level rise from 2000-2024, approximately 3.39 inches (0.28 feet). NCA5 is thus projecting a sea level rise during 2025 and 2050 that is 3.5 to 5.8 times the rate observed during 2000-2024. Chapter 9 further states:

“Looking toward the future, an 11 inch (28 cm) average rise along the contiguous US coastline is expected by 2050 (relative to 2020), with a *likely* range of 9-13 inches.”

...

“There is *high confidence* and it is *likely* that sea levels will rise about 11 inches (likely range of about 9–13 inches) between 2020 and 2050”

In summary, NCA5 presents future sea level rise scenarios that are not directly relatable to either SSP/RCP emissions scenarios nor to global warming levels. The NCA5 scenarios include two scenarios that are higher than the 95th percentile for the extreme emissions scenario RCP8.5 and include hypothesized ice sheet processes in which there is low confidence. Projections to 2050 require rates of sea level rise from 2025 to 2050 that are more than triple the rate observed during 2020-2024. Further, NCA5 ascribes *high confidence* to these sea level rise projections.

More generally, NCA5's inclusion, and even focus, on implausible extreme emissions scenarios supports projections of alarming impacts that are very unlikely to be driven by anthropogenic warming.

7 INADEQUATE NASEM REVIEW: TO BE ADDED

I THINK WE SHOULD DELETE THIS CHAPTER, IT ISN'T VERY STRONG

The National Academies of Science, Engineering and Medicine (NASEM) undertook a detailed review of the draft NCA5 (NASEM 2023).⁷ While they raised some of the same concerns that we have articulated herein, their review is superficial overall and appears to be written by authors who share many of the biases of the NCA5 team. There is an inordinate focus on social and policy issues (e.g., every chapter is assessed under the heading "Comments on Equity and Justice"), rather than on the underlying science. In our assessment NASEM failed to apply the serious rigor one would expect. A few extracted comments from it will illustrate. Note that NASEM review comments are included here in blue font for reference.

7.1 Substantive criticisms by NASEM

- summarize the valid points made by NASEM and check the NCA replies

7.2 Failures to challenge NCA5 flaws

NASEM praised Chapter 2, saying:

The chapter [2] meets the requirements of Section 106 of the GCRA.

Yet contrary to the requirements of Section 106, NCA5 Chapter 2 did not adequately discuss natural variability let alone assess the full climate record available for quantifying natural variability. Chapter 2 actually minimizes natural variability by claiming (unsubstantiated) skill in attributing recent extremes to human causes. For example NCA5's Chapter 2 Introduction states,

"...recent advances in attribution science (KM 3.3) mean that the role of climate change in some extreme events can now be quantified in real time. For example, climate change made the record-breaking Pacific Northwest heatwave of June 2021 2° to 4°F hotter, and in 2017 ..."

CWG25 reviews the expert literature demonstrating that this particular event would have happened with or without climate change and that for CONUS, hot extremes are no more frequent now than they were in the past. NASEM did not challenge the unsubstantiated attribution claims in NCA5.

Notwithstanding NASEM's claim that the Chapter complies with Section 106 of the GCRA, it then acknowledged the absence of discussion of natural variability:

⁷ National Academies of Sciences, Engineering, and Medicine. 2023. *Review of the Draft Fifth National Climate Assessment*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/26757>.

...the discussion and references regarding the role of natural climate variability and its regional differences are missing.

While a nod to natural variability is occasionally found in NCA5, it is usually followed by a “however” to emphasize human influence. One example is the statement just before the claim mentioned above pertaining to extreme event attribution: “There has always been extreme weather, which occurs even in an unchanged climate due to the natural variability of the Earth system. However, recent advances in attribution science (KM 3.3) mean that the role of climate change in some extreme events can now be quantified in real time...”

We pointed **REFERENCE THE SPECIFIC SECTION OF THIS REPORT** out that the evidence regarding heatwaves directly contradicts Key Message 2.2. NASEM did not mention this, instead it focused on a somewhat esoteric issue of terminology:

“Extreme Events Are Becoming More Frequent and Severe.”

Key Message 2.2 is another generally well written key message. However, while the title of this key message includes the word “risk,” the key message is exclusively about hazard. The Committee suggests rewriting the key message title to more accurately reflect the discussion on hazards.

The NASEM review appears to accept NCA5’s use of short data records because it makes no critical remarks about the failure to assess long time series, except for its observation that the use of short records makes the omission of natural variability that much more of a problem:

It is also important to point out that the influence of natural climate variability becomes particularly strong when the climate trend is computed based on short periods of time or small geographic areas.

This comment was largely ignored in the NCA5 final text.

In sum, while the NASEM review might bestow the Academies’ imprimatur on the NCA5 report, it does not necessarily add to its quality for two reasons. As we have demonstrated, the NASEM review falls short in rigor and completeness. And second, the NCA authors are not obligated to follow the NASEM recommendations in crafting their final product.

8 SUMMARY EVALUATION OF NCA5

CHAPTER NEEDS A COMPLETE REWRITE

The most straightforward evaluation of NCA5 is through its statutory requirements. While it is not within our purview to make definitive rulings on compliance, we believe there are several important aspects to consider when evaluating NCA5 against its statutory requirements. Add text per Seth's letter ...

Our expertise in climate science, the foundational area covered by NCA5, allows a different perspective, one that finds the coverage unbalanced and selective. Our review has identified numerous instances where NCA5 falls short of the quality and integrity expected of scientific document of this importance. Furthermore, our examination suggests that the entire process—from the selection of contributing authors to the handling of expert reviews—appears to have been systematically biased toward reinforcing predetermined conclusions and amplifying alarmist messaging rather than presenting a balanced scientific assessment. In short, NCA5 was written to persuade, not inform.

A third perspective for evaluating NCA5 is that of citizens interested in good policymaking. The changing climate is a legitimate public concern, as are concerns about cost of living, economic growth, employment opportunities, and other socioeconomic factors. We share the widespread belief that elected officials should have access to the highest quality information when crafting energy and climate policy decisions that must balance multiple concerns. From this perspective, NCA5 is a missed opportunity. What could have been a valuable contribution to informed tradeoffs instead became a misleading advocacy document that corrupts the policymaking process.

APPENDICES

APPENDIX 1: Charge to the review

APPENDIX 2: statutory requirements for NCA5

APPENDIX 3: Analysis of U.S. Longterm Precipitation Records

DELETE APPENDIX 3. WE SHOULD NOT BE PRESENTING ORIGINAL ANALYSES IN THIS REPORT
[I'm not sure we need both the tables and multipanel figures here. Is anyone really going to look at the tables? Perhaps they can be eliminated and just keep the figures?]

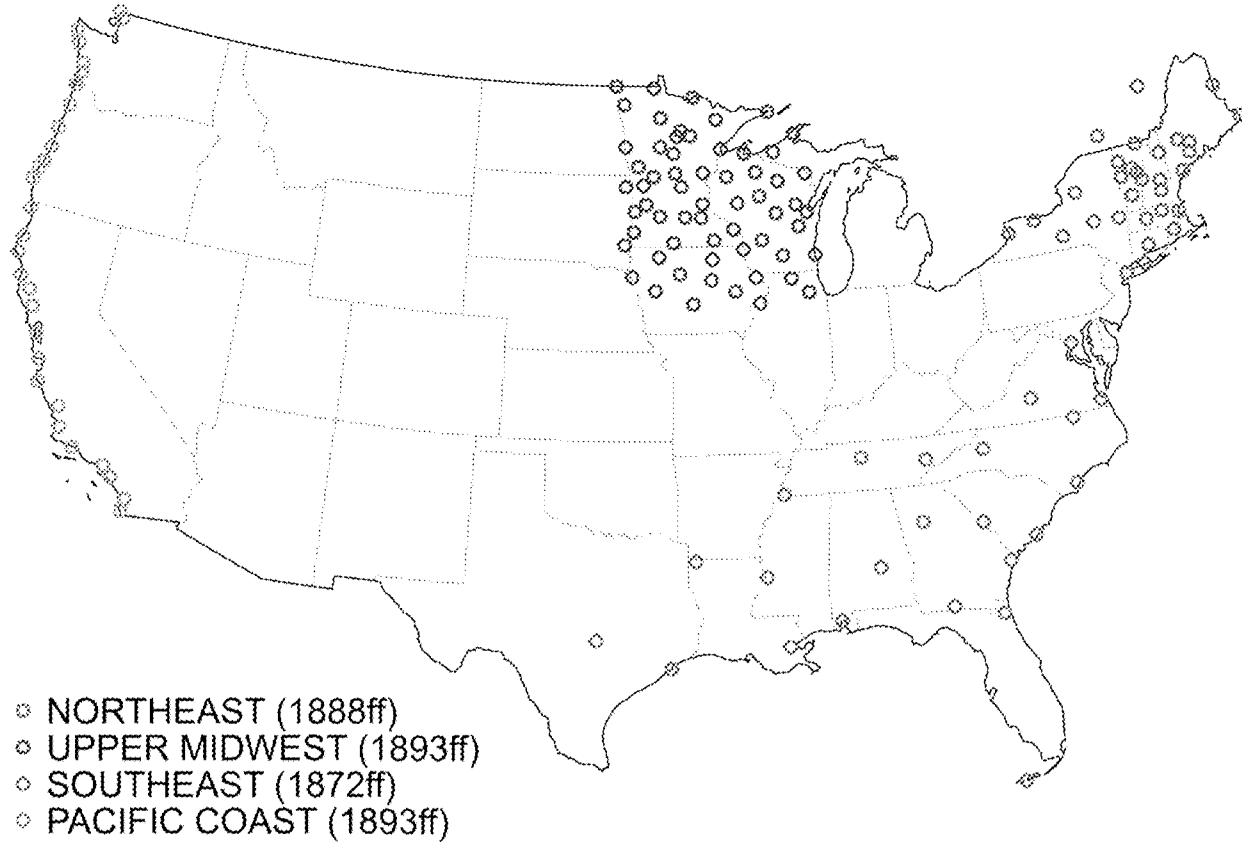


Figure. Stations used in the following analyses.

Table codes: (-) neg insignificant, -- neg significant, (+) pos insignificant, ++ pos significant.

Column 1: Measure

Column 2: Number of stations in that region

Column 3: Count of stations exhibiting a significant positive trend

Column 3: Count of stations exhibiting a significant negative trend

Column 5: Characteristic of region-wide trend

PACIFIC COAST

Since 1893:

	No. stns	+ trends	- trends	region
1-day average	29	0	1	(-)
2-day average	29	0	1	(-)

Avg on non-zero days	29	0	9	--
Variability	29	1	0	(+)
Annual max	29	2	1	(+)
Number of 99 th pct exceedances	29	1	0	(-)

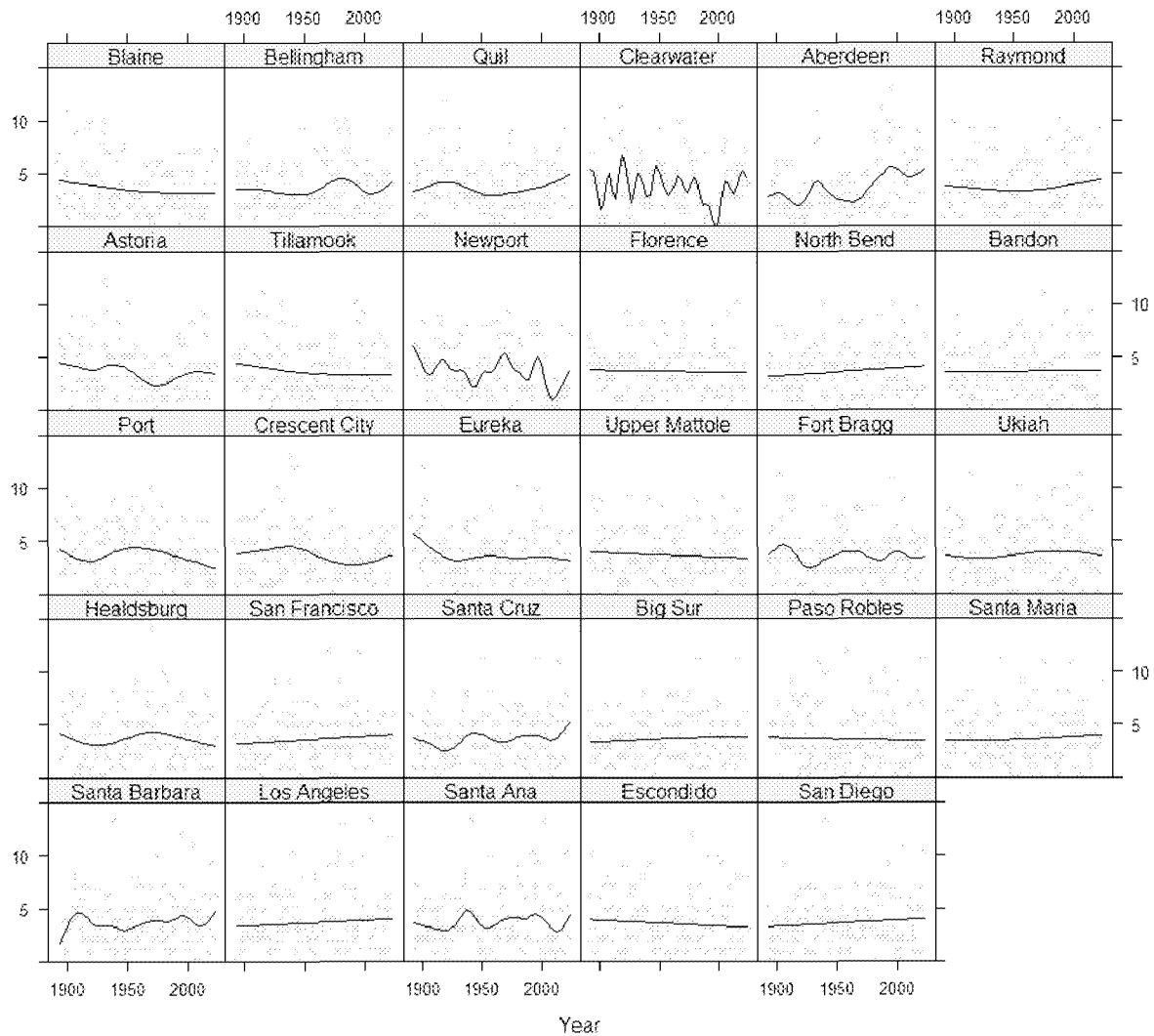
Since 1950:

	No. stns	+ trends	- trends	region
1-day average	29	0	1	(-)
2-day average	29	0	1	(-)
Avg on non-zero days	29	0	4	(-)
Variability	29	2	3	(-)
Annual max	29	6	3	(-)
Number of 99 th pct exceedances	29	2	1	(-)

Since 1980:

	No. stns	+ trends	- trends	region
1-day average	29	0	0	(-)
2-day average	29	0	0	(-)
Avg on non-zero days	29	0	1	(-)
Variability	29	0	0	(-)
Annual max	29	2	1	(-)
Number of 99 th pct exceedances	29	0	0	(+)

Annual No. 99th Percentile Exceedances PC 1893-2024



SOUTHEAST

Since 1873:

	No. stns	+ trends	- trends	region
1-day average	24	1	1	(+)
2-day average	24	1	1	(+)
Avg on non-zero days	24	7	2	(+)
Variability	24	1	0	(+)
Annual max	24	2	0	(+)
Number of 99 th pct exceedances	24	5	0	(+)

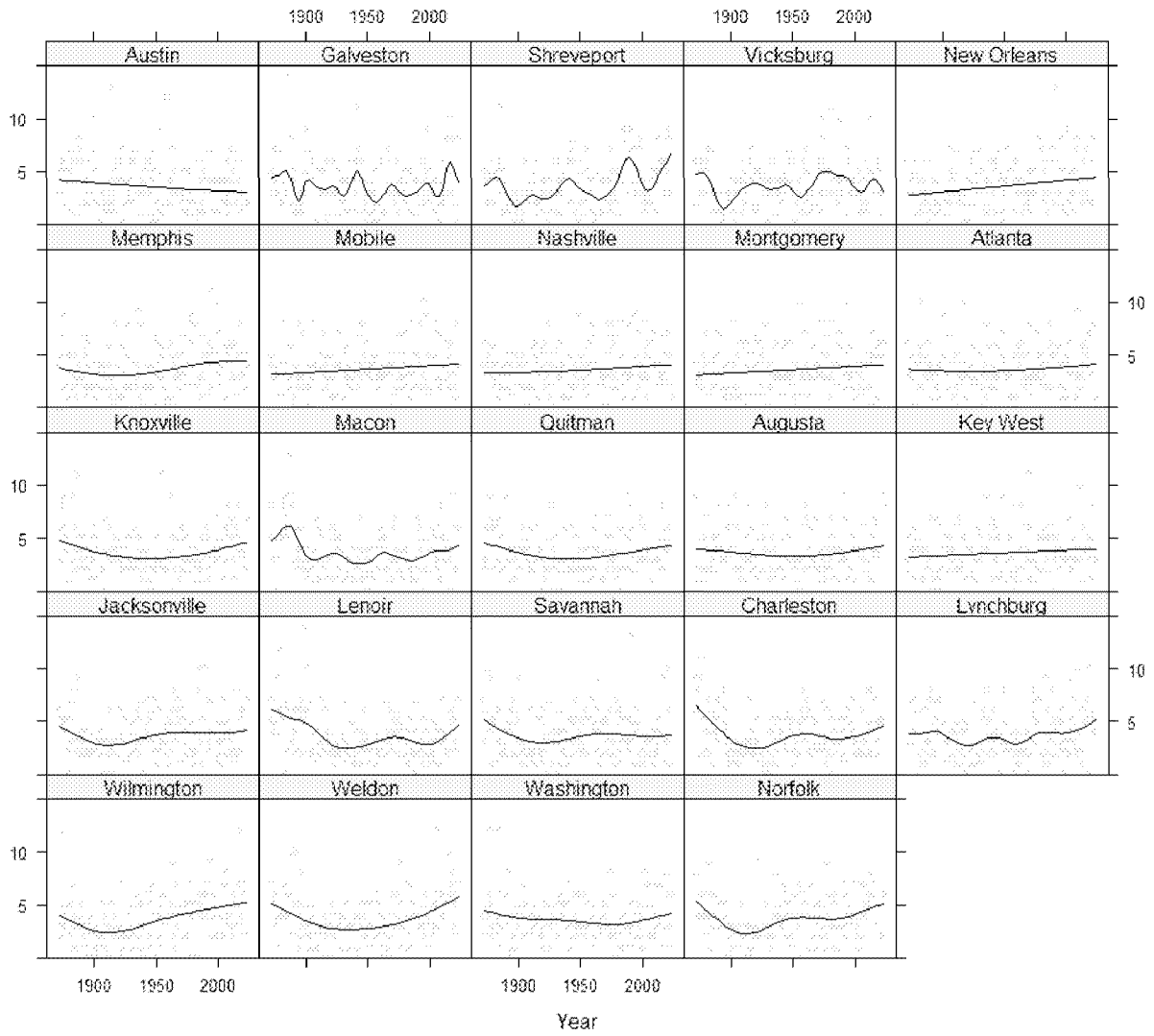
Since 1950:

	No. stns	+ trends	- trends	region
1-day average	24	5	0	++
2-day average	24	5	0	++
Avg on non-zero days	24	5	1	++
Variability	24	6	0	++
Annual max	24	4	0	++
Number of 99 th pct exceedances	24	4	0	(+)

Since 1980:

	No. stns	+ trends	- trends	region
1-day average	24	5	0	(+)
2-day average	24	5	0	(+)
Avg on non-zero days	24	5	1	(+)
Variability	24	3	0	(+)
Annual max	24	4	0	(+)
Number of 99 th pct exceedances	24	4	0	(+)

Annual No. 99th Percentile Exceedances SE 1873-2024



MIDWEST

Since 1893:

	No. stns	+ trends	- trends	region
1-day average	61	23	0	++
2-day average	61	23	0	++
Avg on non-zero days	61	2	12	(+)
Variability	61	12	0	++
Annual max	61	9	0	(+)
Number of 99 th pct exceedances	61	10	0	(+)

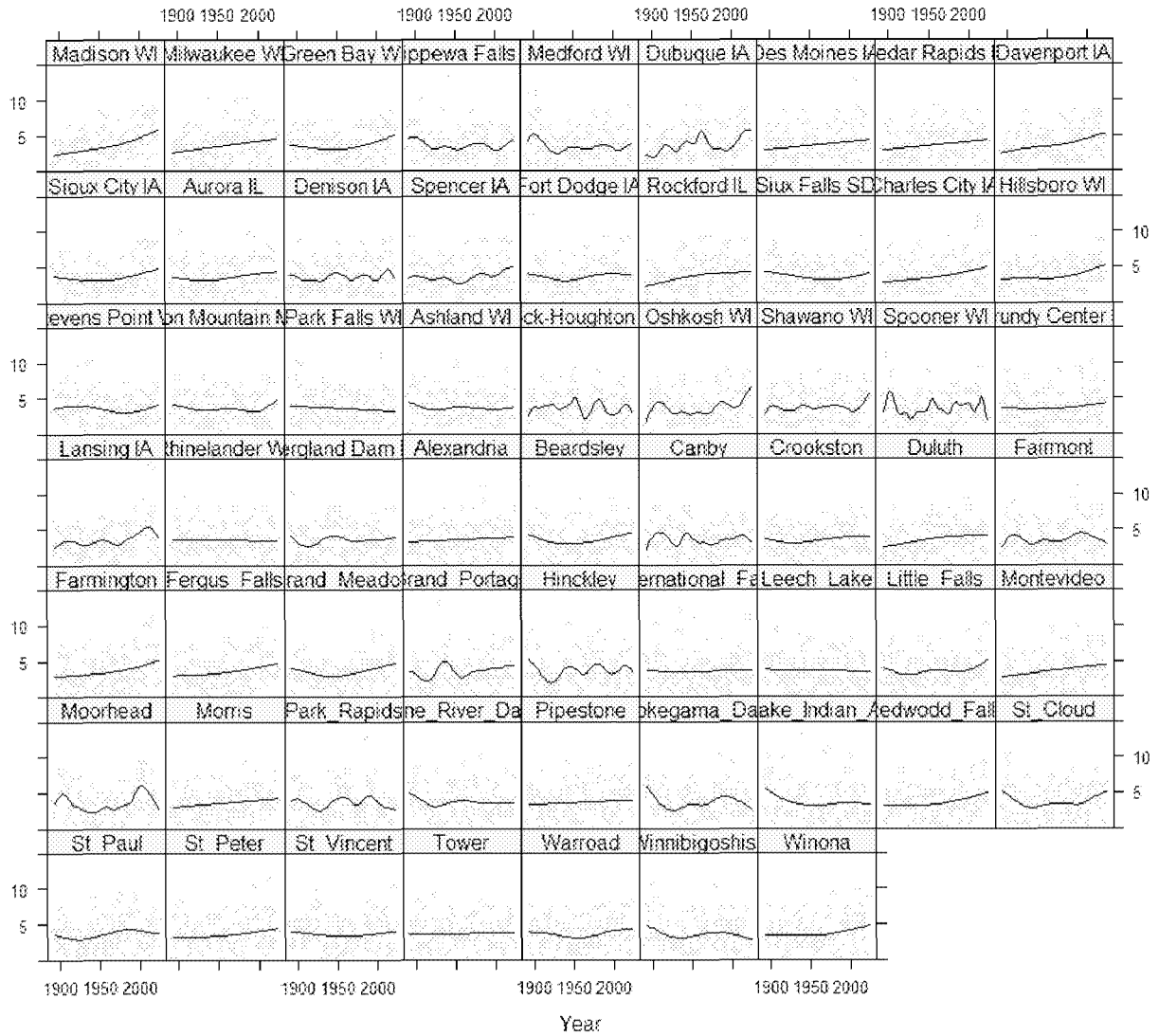
Since 1950:

	No. stns	+ trends	- trends	region
1-day average	61	28	2	++
2-day average	61	28	2	++
Avg on non-zero days	61	11	1	++
Variability	61	16	0	(+)
Annual max	61	8	0	(+)
Number of 99 th pct exceedances	61	19	0	++

Since 1980:

	No. stns	+ trends	- trends	region
1-day average	61	6	1	(+)
2-day average	61	6	1	(+)
Avg on non-zero days	61	8	2	(+)
Variability	61	5	1	(+)
Annual max	61	0	1	(+)
Number of 99 th pct exceedances	61	5	3	(-)

Annual No. 99th Percentile Exceedances MW 1893-2024



NORTHEAST

Since 1888:

	No. stns	+ trends	- trends	region
1-day average	27	12	0	++
2-day average	27	12	0	++
Avg on non-zero days	27	7	1	(+)
Variability	27	4	0	(+)
Annual max	27	3	0	(-)
Number of 99 th pct exceedances	27	5	0	(+)

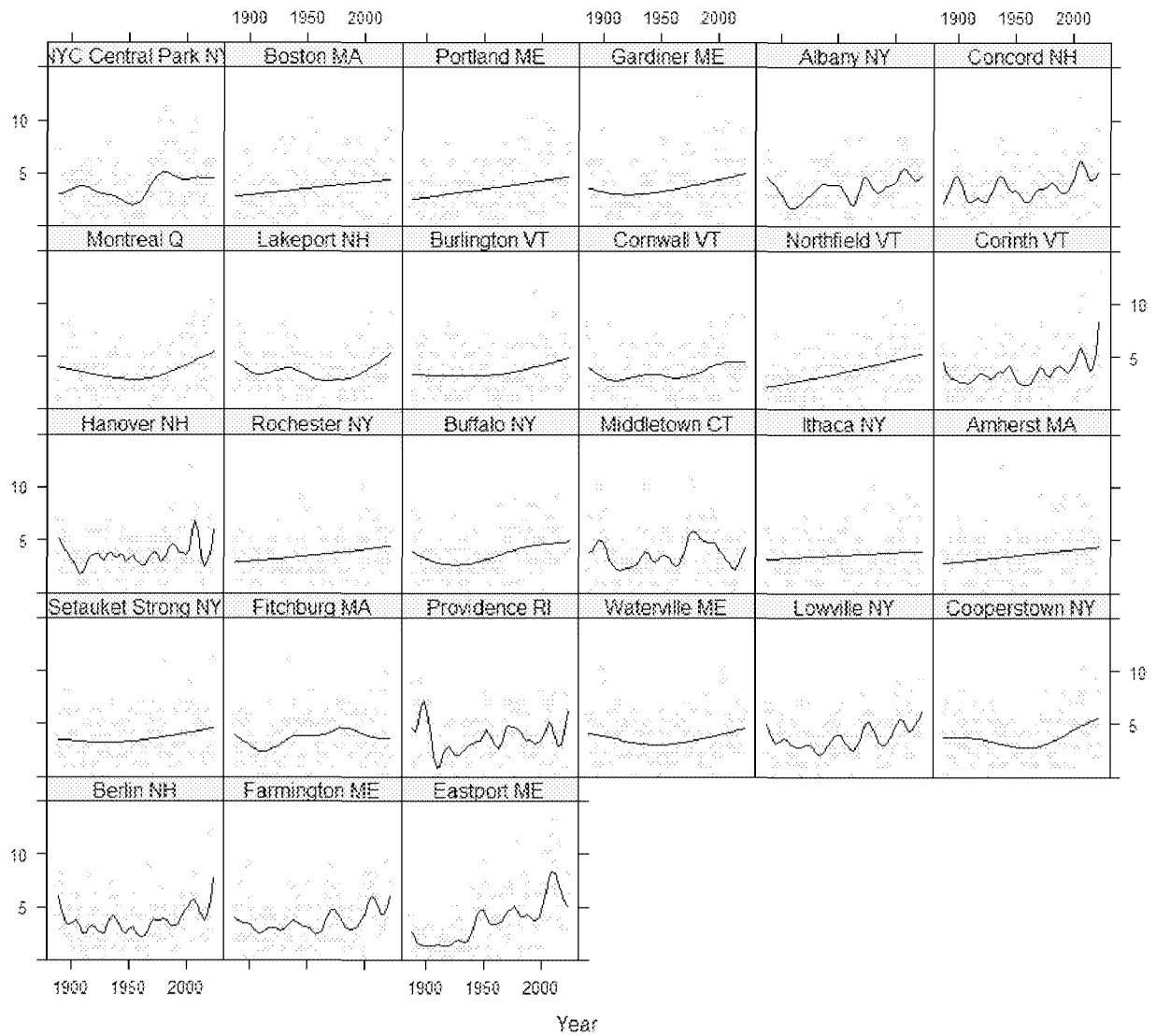
Since 1950:

	No. stns	+ trends	- trends	region
1-day average	27	12	0	++
2-day average	27	12	0	++
Avg on non-zero days	27	7	1	(+)
Variability	27	4	0	(+)
Annual max	27	3	0	(-)
Number of 99 th pct exceedances	27	5	0	++

Since 1980:

	No. stns	+ trends	- trends	region
1-day average	27	10	1	++
2-day average	27	10	1	++
Avg on non-zero days	27	6	0	(+)
Variability	27	2	0	(+)
Annual max	27	1	0	(+)
Number of 99 th pct exceedances	27	1	1	++

Annual No. 99th Percentile Exceedances NE 1888-2024



ABOUT THE AUTHORS

[Insert updated bios]

From: Steven Koonin <steven.koonin@gmail.com>
Sent: Tuesday, June 17, 2025 5:26 PM
To: 'Ross McKittrick'; 'Judith Curry'; 'Roy W. Spencer'; 'John Christy'; 'Steven Koonin'; 'Travis Fisher'; 'Josh Loucks'
Subject: NCA5 report, June 17 edition
Attachments: 01.NCA5.Review.June17 [SEK].docx

The attached accepted all the changes in Ross' June 13 version and then tracked subsequent changes.

I've done a close edit of the entire text and added an executive summary and concluding chapter. I also worked on the NASEM review chapter, but there's still a bit missing.

As you'll see, a few other bits are still missing, but this should serve as a basis for our discussion on Friday.

SEK

From: Ross McKittrick <ross.mckittrick@gmail.com>
Sent: Friday, June 13, 2025 8:44 AM
To: Judith Curry <curry.judith@gmail.com>; Roy W. Spencer <roywspencer@hotmail.com>; John Christy <climateman60@gmail.com>; Steven Koonin <steven.koonin@googlemail.com>; Travis Fisher <travis.scott.fisher@gmail.com>; Josh Loucks <loucksj14@gmail.com>
Subject: June 13 edition - for SEK review

This is the current version for Steve to go through. I've added NASEM review material in Ch 7 currently as a placeholder and we'll work on that stuff offline.

Ross

Review of the Fifth National Climate Assessment

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EXECUTIVE SUMMARY

This report critically evaluates the Fifth National Climate Assessment (NCA5), finding it an inadequate basis for climate and energy policies. A detailed review of the foundational chapters on climate science raises several key concerns:

Scientific Integrity

- An advocacy tone, particularly in the Overview chapter, inconsistent with scientific objectivity
- An endemic overconfidence when stating conclusions, including inflated certainty levels and overstatement of findings from underlying sources

Flawed methodology

- Use of *ad hoc* time scales for trend analyses in areas such as precipitation and heatwaves
- An overemphasis on extreme scenarios for future emissions
- Inadequate traceable accounts to support key conclusions

Deficient Review Process

- A review by the National Academy of Sciences, Engineering, and Medicine (NASEM) failed to challenge some fundamental flaws in NCA5
- The NCA5 authors failed to adopt some improvements recommended by NASEM

The report shows NCA5 to be a biased and incomplete picture of climate science that skews toward excessive climate risk. Consequently, NCA5 should not be used as basis for climate and energy policies.

1 INTRODUCTION

1.1 About this Report

This report responds to a request from OSTP Director Michael Kratsios (reproduced in Appendix1) that we assess the suitability of the Fifth National Climate Assessment for informing climate and energy policies.

To conduct this assessment we reviewed NCA5 itself, the National Academies (NASEM) review of the Third Order Draft, and the USGCRP responses to that review. We have drawn upon our long experience working on advisory reports, including for the NASEM, the IPCC and other organizations, as writers, reviewers and study leaders.

We find that NCA5 should not be relied on for policy making as it is an incomplete and misleading picture of our understanding of the changing climate and the risks it poses to the nation. NCA5 was selective and incomplete in its survey of climate science as of its publication in 2023 and has become even more so in the years since. We have reviewed many key scientific developments in a separate report to Energy Secretary Wright (Climate Working Group 2025, herein denoted “CWG25”). The overall effect of the biases and omissions of NCA5 is an excessively dire picture of climate risk.

To support our finding, the following sections of this chapter provide some background on the National Climate Assessments and the standards by which we have assessed NCA5. Chapters 2 through 6 then detail important ways in which NCA5 fails to meet those standards. In Chapter 7, then follows with an assessment of the NASEM review. Finally, Chapter 8 summarizes our evaluation of NCA5.

1.2 About the National Climate Assessments

The U.S. Global Change Research Program (USGCRP) was established by Presidential Initiative in 1989 and mandated by Congress in the Global Change Research Act (GCRA) of 1990 to develop and coordinate “a comprehensive and integrated United States research program which will assist the Nation and the world to understand, assess, predict, and respond to human-induced and natural processes of global change.”

The National Climate Assessment (NCA) Reports evolved from the GCRA requirement to

Prepare and submit to the President and the Congress an assessment which (1) integrates, evaluates, and interprets the findings of the Program and discusses the scientific uncertainties associated with such findings; (2) analyzes the effects of global change on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biological diversity; and (3) analyzes current trends in global change, both human-induced and natural, and projects major trends for the subsequent 25 to 100 years.

The five NCA Reports to date have interpreted this mandate in different ways:

- NCA1 (2000) was a multidisciplinary effort to study and portray in regional detail the potential effects of human-induced global warming on the United States.
- NCA2 (2009) was a relatively short report that not only focused on the potential consequences of climate change but also sought to identify potential adaptation measures and identify the highest priorities for future research.

- NCA3 (2014) was an expanded effort that continued along the lines of NCA2, and was distinguished by a comprehensive review process, including a review by the National Academy of Sciences. NCA3 introduced a traceability analysis for each key finding, including a description of uncertainties.
- NCA4 (2017/2018) was a further expanded effort published in two volumes: I Climate Science Special Report, and II Impacts, Risk, and Adaptation in the United States. This was the first NCA report to devote significant effort to assessing climate science.
- NCA5 (2023) returned to a single volume format, reducing discussion of climate science to a cursory two chapters, with continuing with a focus on regional and sectoral impacts of climate change. NCA5 expanded its remit to topics that are arguably outside the purview of the USGCRP, focusing on “Climate Action” and policy recommendations with a social justice emphasis. NCA5’s self-description is reproduced as Appendix II.

These successive interpretations of the NCA are poorly aligned with the GCRA’s statutory requirements. Only NCA4 gives serious consideration to climate science, which receives the great majority of USGCRP funding, and even then misrepresents some important points (Section 1.4 below offers an example). Natural climate variability is essentially dismissed as unimportant in NCA4 and barely mentioned in NCA5 in most contexts, despite the mandate to include both human-caused and natural climate change. Most significantly, NCA5 has redirected the focus away from climate science and even the hazard elements of impacts, towards evaluation of societal vulnerabilities and advocacy for particular policy options, especially wind and solar power. The cover image for the NCA5 Report is the installation of a solar panel.

1.3 Standards for Assessing NCA Products

In Appendix 2 we include a letter of guidance from the Office of General Counsel, U.S. Department of Energy, summarizing the statutory requirements governing USGCRP work products in general and NCA products in particular.

We can summarize the standards applicable to the NCA as follows:

[- details](#)

Beyond the statutory requirements we draw attention to two other pertinent standards. President Trump’s executive order of May 23, 2025, “[Restoring Gold Standard Science](#)” enumerates some of the characteristics of good science:

- i. reproducible;
- ii. transparent;
- iii. communicative of error and uncertainty;
- iv. collaborative and interdisciplinary;
- v. skeptical of its findings and assumptions;
- vi. structured for falsifiability of hypotheses;
- vii. subject to unbiased peer review;
- viii. accepting of negative results as positive outcomes; and
- ix. without conflicts of interest.

Although these should be self-evident to those trained in science, it is surprising that some scientists have found them controversial.

There are other desiderata for scientific reports that will be highly influential on climate policymaking. Among them are statements about the strength of climate knowledge. The IPCC's approach is based on judgment of the available evidence and agreement among experts. More sophisticated knowledge characterizations for risk management include (Aven 2017)¹:

- The degree to which the assumptions made are reasonable/realistic based on background knowledge
- The degree to which data/information exists and are reliable and relevant
- The degree to which there is disagreement among experts (including those from different environments or academic fields)
- The degree to which the phenomena involved are understood and accurate models exist
- The degree to which the knowledge has been thoroughly examined with respect to unknown knowns

Good climate and energy policies will balance the risks and benefits of a changing climate against the world's growing demand for reliable and affordable energy. To strike that balance, policymakers must understand at least two complex and nuanced topics: the certainties and uncertainties of climate science and the technoeconomic realities of energy systems. Experts in those subjects have a unique responsibility to communicate their understanding to non-experts clearly, completely, and without bias.

Expertise in energy systems resides largely in the private sector, where it is essential to providing the reliable and affordable energy services that are the lifeblood of society. Understanding is therefore continually refined and tested by the discipline of the marketplace. In contrast, climate science expertise is found largely in the non-profit realm of universities and government laboratories and so has a more academic character.

In recent decades, climate science has engendered passion and emotion. Indeed, some younger climate scientists have gone into the field to "save the planet." Further, the field of climate science has been politicized by NetZero mandates. It is then not surprising that objectivity can suffer when climate scientists communicate their understanding to non-experts. This lack of objectivity usurps the public's right to make informed choices and undermines their confidence in the scientific enterprise.

In 1980, then-President of the National Academy of Sciences Philip Handler identified the problem in an editorial² that resonates eerily four decades later:

Difficulty arises in the scientific community from confusion of the role of scientist *qua* scientist with that of scientist as citizen, confusion of the ethical code of the scientist with the obligation of the citizen, blurring the distinction between intrinsically scientific and intrinsically political questions. When scientists fail to recognize these boundaries, their own ideological beliefs, usually unspoken, easily becloud seemingly scientific debate.

¹ Aven, Terje (2017) "Improving Risk Characterisations in Practical Situations by Highlighting Knowledge Aspects, with Applications to Risk Matrices," *Reliability Engineering & System Safety* 167 (November 2017): 42–48 <https://www.sciencedirect.com/science/article/pii/S0951832016306950>

² Handler, Philip (1980) Public Doubts About Science. *Science* 208(4448) p. 1093 <https://www.science.org/doi/10.1126/science.208.4448.1093>

1.4 When Peer Review Fails

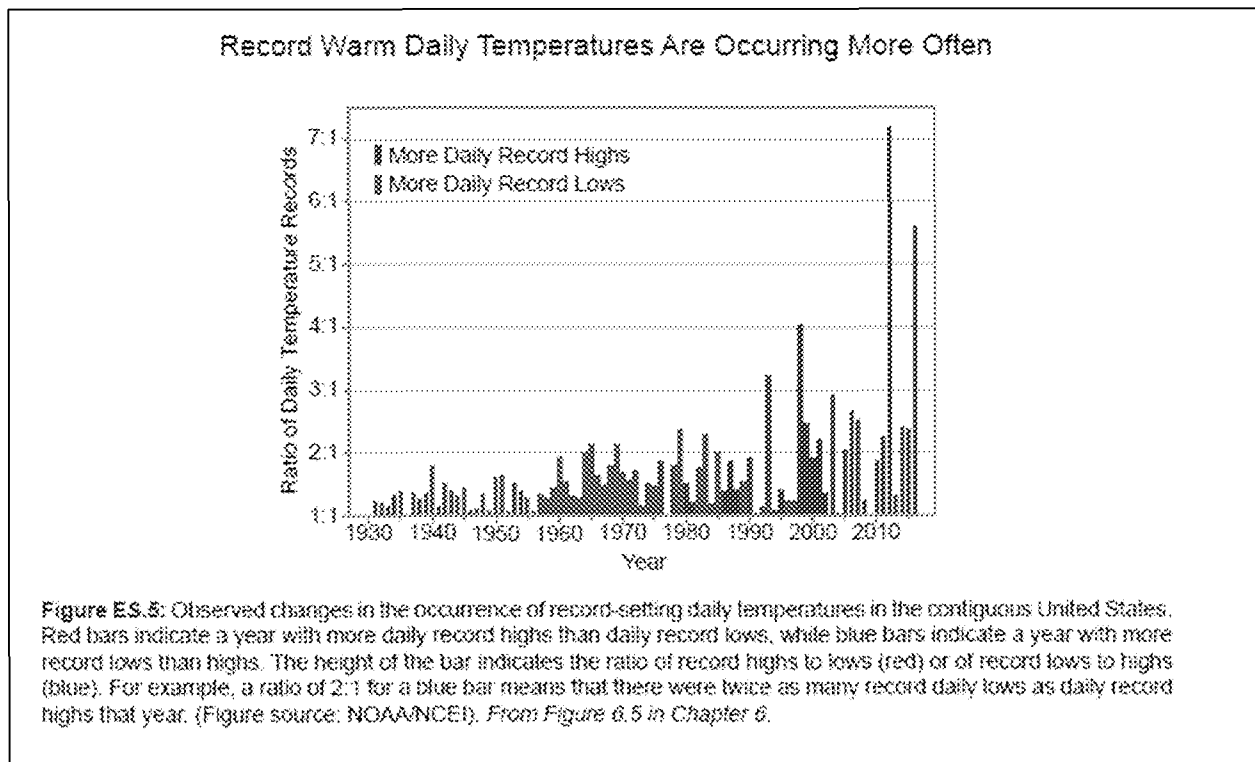
Peer review of reports like IPCC and NCA products is not a silver bullet that guarantees quality. The peer review process for these reports differs in some important respects from traditional peer review in academic journals. First, NCA reviewers are volunteers who self-select what parts of the report to read, whereas the editors of academic journals recruit reviewers and assign them to specific papers. As a result, there is no guarantee that any particular section of an NCA report was reviewed by anyone, **WHAT ABOUT THE NASEM REVIEW?** let alone by someone with a perspective that differs from the authors. In fact, many potential reviewers have given up over the years because their input has systematically been ignored. Second, NCA authors have near complete authority whether to accept or reject review comments. By contrast, the Editor of an academic journal mandates the author to respond and the reviewer gets to assess its adequacy. And third, the work of an NCA chapter author team is guaranteed to be published, whereas academic journals routinely reject papers that do not pass review.

These points are important to bear in mind because some readers might dismiss any criticism of NCA products out of hand on the grounds that they were “peer reviewed”. But the test of a report is whether its contents are a valid representation of the available evidence. Here we give an example in which NCA4 gave prominence to a figure that completely misrepresented the underlying data and which evaded peer review to do so. Further details can be found in Koonin (2024).

As shown in CWG25 Section 6.3 the number of heat extremes in the U.S. peaked in the 1930s and has declined ever since. Considering cold and hot extremes together the U.S. the U.S. climate has become more moderate over time. NCA4’s Part I (Climate Science Special Report, CCSR) says (prominently and with *Very High Confidence*) on Page 19 of the Executive Summary:

There have been marked changes in temperature extremes across the contiguous United States. The number of high temperature records set in the past two decades far exceeds the number of low temperature records.

and offers this figure in support:

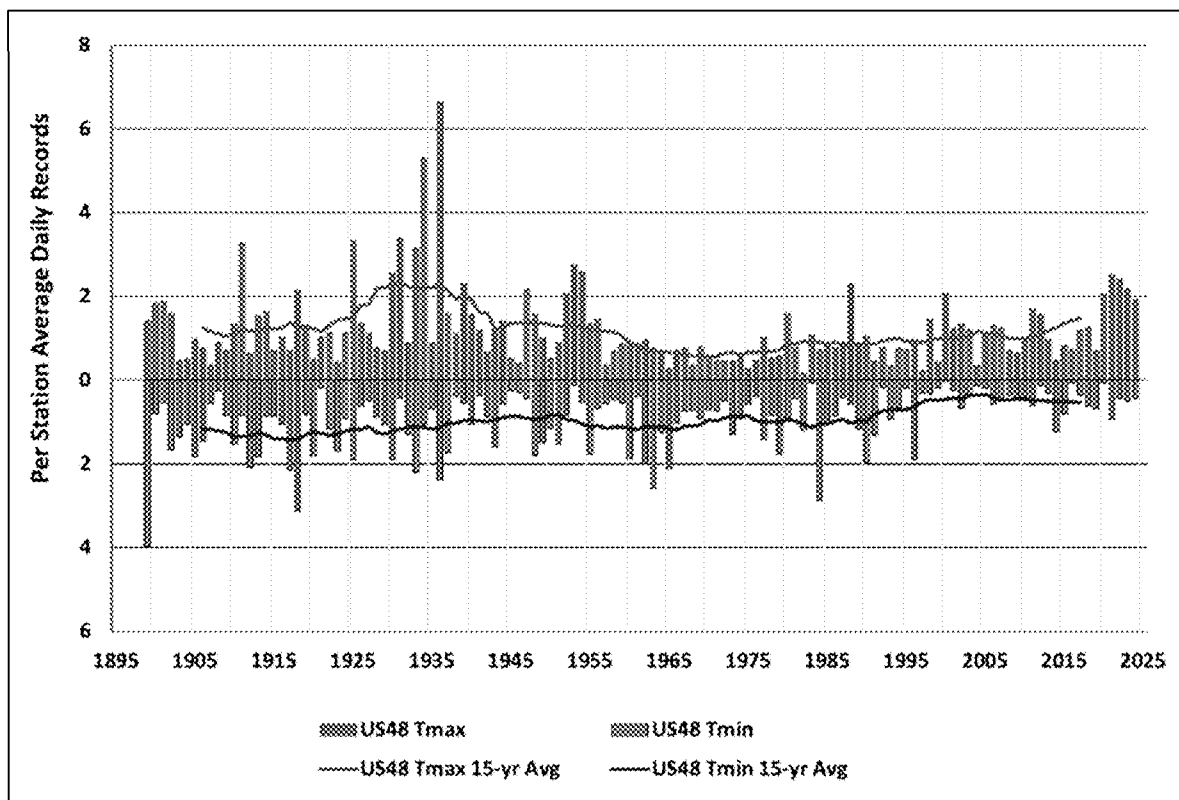


The figure appears to validate the claim that record warm daily temperatures are occurring more often. But the underlying data do not. Rather, they show that extreme heat in the U.S. peaked in the 1920s and 1930s and declined thereafter, as supported by Figure 6.4 deep within the CSSR itself (reproduced in our Section 4.2 below).

Figure ES.5 does not even show what its title implies, as it displays not simple counts of cold and warm extreme events, but rather ratios of the two counts. In fact, both types of extremes declined over the sample interval, but cold events declined more than warm events, so the ratio of warm extremes to cold extremes increased. By graphing the ratio instead of counts, NCA4 creates a visual impression opposite to what is in the data.

Figure 6.3.3 of CWG25 (reproduced below) shows the results of a proper analysis of the data – defining each record as the singular extreme in the sample interval, displaying numbers of warm and cold records separately, and beginning the analysis in 1899 rather than 1930. It makes evident the exceptional heat of the 1920s and especially the 1930s, peaking in 1936.³ The frequency of cold records has declined, especially over the last quarter of the period in which only 13 percent of the extreme cold events were measured. In contrast, 25 percent of the heat records were achieved in the last quarter, which is consistent with statistical expectations. As a result, the ratio of heat to cold extremes shown in Figure ES.5 of the CSSR explodes in recent decades. The overall reduction in numbers of both cold and hot extremes over the past century indicates a climate *less* prone to extremes, in sharp contrast to the message of NCA4 Figure ES.5.

³ The increased heat of the past five years is too brief to be deemed climatically significant and, in any event, occurred after the CSSR was published in 2017.



Number of daily record High (red) and Low (blue) temperatures for warm and cold seasons in the CONUS. The lines represent the 15-year running, centered average. Source: 1,211 USHCN stations supplemented as needed to achieve a minimum of 92 percent of observations in the 126-year period since Dec 1898. US48: contiguous U.S. states. Tmax: maximum temperature. Tmin: minimum temperature. Source: CWG25 Figure 6.3.3.

The National Academies' expert review panel criticized the discussion of temperature extremes in a late draft of the CSSR. In reference to the CSSR's Key Finding 2 of Chapter 6, they said:

Further, it is difficult to understand how a statement that includes increases in extreme warmth can be associated with a high confidence or extremely likely statement, given that most of the graphics in this chapter show a decrease in extreme warmth in the historical record.

The Federal official in charge of the CSSR (Michael Kuperberg, Executive Director of the USGCRP) responded to the Academies' review by noting that

Almost every recommendation from the NAS was incorporated [in the final version]... and a new figure was added on changes in record high and low temperatures

The "new figure" referred to is the Figure ES.5, which did not appear in the draft reviewed by the Academies' panel. It seems unlikely that the Academies panel ever saw that figure because they

surely would have commented if they had and it wouldn't have survived to publication. And the figure's problems were evidently not flagged (or were ignored) in the subsequent internal government reviews.

With this background we now present our critique of NCA5.

2 NCA5 OVERVIEW CHAPTER: HYPERBOLIC ADVOCACY LANGUAGE AND UNSCIENTIFIC TONE

[Fix formatting in "UNSCIENTIFIC"]

NCA5 Chapter 1, "Overview", holds a prominent place in the Report since it summarizes the whole report and is the only section that many will read. Although the later chapters of NCA5 contain much sound scholarly content, Chapter 1 is marred by an activist tone and language that aggressively promotes mitigation policies. As such, this chapter adds an imprimatur of scientific authority to oversimplified declarations of opinion about public policy. Many examples can be cited; here we note a few that are particularly egregious.

Chapter 1 opens as follows:

The more the planet warms, the greater the impacts. Without rapid and deep reductions in global greenhouse gas emissions from human activities, the risks of accelerating sea level rise, intensifying extreme weather, and other harmful climate impacts will continue to grow. Each additional increment of warming is expected to lead to more damage and greater economic losses compared to previous increments of warming, while the risk of catastrophic or unforeseen consequences also increases.

This statement presupposes that all warming is anthropogenic, that all warming is bad and causes economic damage, and that warming intensifies extreme weather. Such sweeping generalizations go well beyond what science has or can establish. The statement also refers to growing risks without saying whether they were large to begin with -- a small risk that grows may still be a small risk. A scientifically-sound version of this paragraph would instead say something like the following:

The Earth is warming because of a combination of natural and anthropogenic influences. This warming will generate a mix of benefits and harms that varies by region, to which society should be prepared to adapt. Some types of extreme weather have worsened recently, while others have not changed or have even declined in intensity. Reducing emissions of greenhouse gases might slow the warming although such policies have proven to be costly and disruptive, so any climate actions to be weighed against the potential benefits.

On the next page the Overview goes on to say:

Each additional increment of warming leads to greater risks [here it lists 7 key components of society including food security and the economy]... Without deeper cuts in global net emissions, climate risks to the US will continue to grow... Action to limit future warming and reduce risks can have near-term benefits and opportunities: low-carbon energy jobs, Improved air quality, Health benefits, Economic benefits..."

The authors write as if climate policy does not involve trade-offs and all measures to reduce future warming will be effective and beneficial. But the vast body of scholarship on climate science and economics does not support such simplistic claims. Not every additional increment of warming leads to economic harms; in fact, NCA5 Chapter 19 acknowledges that there will also be benefits. Nor is

climate policy guaranteed to create jobs or benefit the economy; in many cases it has done the opposite. Such deceit is a disservice to policymakers.

Pages 8 and 9 of the Overview promote renewable energy options by noting, correctly, that the leveled costs of wind/solar generation have fallen sharply since 2010, and so offers this rationale for pursuing deep emission reductions:

Recent growth in the capacities of wind, solar, and battery storage technologies is supported by rapidly falling costs of zero- and low-carbon energy technologies, which can support even deeper emissions reductions. For example, wind and solar energy costs dropped 70% and 90%, respectively, over the last decade, while 80% of new generation capacity in 2020 came from renewable sources.

Yet it has long been known that intermittent renewables generation must be supplemented by dispatchable generation to meet grid reliability standards, and that doing so (e.g., through natural gas, fission, or storage) significantly increases the cost of electricity. Further, there are yet unmet synchronization challenges in transmission grids with heavy penetration of wind and solar power. Here again it is advisory malpractice not to acknowledge these facts.

Page 14 of the Overview presents future emission scenarios with the following description: “Climate modeling experts develop global climate projections for a range of plausible futures.” The word “plausible” is applied to all the scenarios. The accompanying Figure includes both SSP3-7.0 and SSP5-8.5, the latter reaching the same radiative forcing as RCP8.5. The figure does not compare observed emissions with previous projections nor does it caution readers that SSP3-7.0 and SSP5-8.5 are extreme worst case scenarios that, like RCP8.5, have been heavily criticized in the scientific literature (CWG25 3.2.1). By describing the entire envelope of emission projections as “plausible” the report opens the door to later presenting impacts associated with extreme and implausible emission scenarios as part of a baseline “business-as-usual” future.

Page 17 of the Overview introduces the discussion of risks from extreme weather events by saying “Harmful impacts from more frequent and severe extremes are increasing across the country.” This creates the impression that disaster losses are driven by trends in extreme weather. While the section goes on to acknowledge that some of the increase is due to increases in the value of assets at risk it then invokes the NOAA Billion Dollar Dataset as evidence of extreme weather getting worse. Scientists have shown that this is an invalid metric (CWG 10.2) since it measures the growth of the economy not the frequency of extreme weather, and indeed NOAA has recently withdrawn the data product. Even though it was still distributed by NOAA at the time of the NCA5, the report authors should have assessed it skeptically and seen that it was unfit for the purpose of measuring climate trends.

Page 23 of the Overview states, in large font:

Climate changes are making it harder to maintain safe homes and healthy families; reliable public services; a sustainable economy; thriving ecosystems, cultures, and traditions; and strong communities.

It is pointless to try to evaluate this statement on scholarly grounds; it is self-evidently hyperbolic. This kind of language doesn’t belong in a scientific assessment report. Its prominent inclusion points not only to the willingness of NCA5 authors to promote alarm, but also the ineffectiveness of the review process in not ensuring such statements are removed.

The tone of the Overview chapter hints at the priorities that governed the writing of the entire report. Word counts of the full report are another crude indicator of those priorities

Term	Number of occurrences
Forcing	111
Uncertainty	384
Watts	19
Culture/culturally	854
Equity/equitable	572
Indigenous	890
Sustainable	295
Racism/racial	153

3 OVERCONFIDENCE WHEN STATING CONCLUSIONS

3.1 Inflated certainty levels

Overconfidence in stating conclusions is an endemic problem in NCA5. The authors frequently make sweeping generalizations without appropriate caveats or acknowledging uncertainties. The overconfidence begins with inflated language to describe certainty levels.

NCA5 uses specific terms to convey information about scientific confidence associated with important finds, observations and projections. The Front Matter of NCA5 states that

confidence in a finding is based on the type, amount, quality, strength, and consistency of evidence; the skill, range, and consistency of methods to detect, evaluate, attribute, and interpret climate trends; and the degree of agreement across scientific information sources.

and Table 1 from the Front Matter provides calibrated language for confidence assessment:

Very high:	Strong evidence (established theory, multiple sources, well documented and accepted methods, etc.). High consensus
High:	Moderate evidence (several sources, some consistency, methods vary and/or documentation limited, etc.). Medium consensus
Medium:	Suggestive evidence (a few sources, limited consistency, methods emerging, etc.) Competing schools of thought.
Low:	Inconclusive evidence (limited sources, extrapolations, inconsistent findings, poor documentation and/or methods not tested, etc.). Disagreement or lack of opinions among experts.

This terminology is inflated: *high confidence* with just moderate evidence and medium consensus; *medium confidence* with only suggestive evidence and competing schools of thought. This inflation in terminology leads to overconfidence in conclusions.

Even with this inflated terminology, NCA5 further inflates the confidence level of many of its conclusions to well beyond what the IPCC has concluded with more thorough justification, and also by incorrectly applying its own standards. Here are two examples.

Key Message 3.1 Traceable Account states:

There is *very high confidence* that emissions of GHGs from human activities, fossil fuel use in particular, have unequivocally caused *all* global warming observed over the industrial era.

while the corresponding statements from IPCC AR5 and AR6 are

AR5: It is *extremely likely* that *more than half* of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic increase in greenhouse gas concentrations and other anthropogenic forcings together.” (IPCC, 2013)

AR6: The *likely* range of total human-caused global surface temperature increase from 1850–1900 to 2010–2019 is 0.8°C to 1.3°C, with a best estimate of 1.07°C. It is *likely* that well-mixed GHGs contributed a warming of 1.0°C to 2.0°C, other human drivers (principally aerosols) contributed a cooling of 0.0°C to 0.8°C, natural drivers changed global surface temperature by –0.1°C to +0.1°C, and internal variability changed it by –0.2°C to +0.2°C. It is *very likely* that well-mixed GHGs were the main driver of tropospheric warming since 1979.

The IPCC AR5 and AR6 statements provide likelihood assessments but not a confidence level. While NCA5 claims with *very high confidence* that fossil fuels have unequivocally caused *all* global warming, AR5 refers to “*more than half* of the observed warming” and AR6 provides a more nuanced statement that relates to a *likely* range of warming contributed to by human drivers.

As a second example, NCA5 Key message 2.2 reads

Hurricanes have been intensifying more rapidly since the 1980s (*high confidence*) and causing heavier rainfall and higher storm surges (*high confidence*).

No justification is provided in Chapter 2 for the *high confidence* conclusion on higher storm surges or hurricanes causing heavier precipitation. The Traceable Accounts section, Description of Confidence and Likelihood states:

Basic physical understanding and climate models both provide robust explanations for the links between climate change and observed changes in these extremes: this is why the authors also have *high confidence* that storms are delivering more rainfall and high confidence that storm surges are becoming higher.

In short, NCA5 provides no observational basis or published research for their *high confidence* assertions that hurricanes are causing heavier rainfall and higher storm surges, thus failing to meet its own standards for a *high confidence level*.

3.2 Overstating findings in underlying sources

Although we did not do a detailed audit of NCA5's use of source material, spot checks turned up evidence of a pattern of overstatement.

Chapter 2 page 11 reports on an increase in precipitation in some areas and attributes it to climate change:

Many eastern regions of the country are getting wetter (Figure 2.4). Average annual precipitation from 2002-2021 was 5%-15% higher relative to the 1901-1960 average in the central and eastern US, a trend attributable to climate change.⁴

Note that this is a non-standard metric; we will discuss NCA5's inconsistent choices of time scales of analysis below. The claims were attributed to the following paper:

- Knutson, Thomas and Fanrong Zeng (2018) "Model Assessment of Observed Precipitation Trends over Land Regions: Detectable Human Influences and Possible Low Bias in Model Trends" *Journal of Climate* 31(12)
<https://journals.ametsoc.org/view/journals/clim/31/12/jcli-d-17-0672.1.xml>

But Knutson and Zeng did not say these things. They examined linear trends over 1901 – 2010, 1951 – 2010 and 1981 – 2010. They did not compare average rainfall over 2002 - 2021 to average rainfall over 1901 – 1960, if only because their study was published in 2018. For 1981-2010, they noted stronger trends in some areas but cautioned that such changes are consistent with natural variability, and they did not claim attributable trends were observed over the United States:

Observed annual precipitation trends over the recent 30-yr period 1981–2010 (Fig. 5) have generally stronger magnitudes (in mm yr⁻¹ decade⁻¹) than observed trends for 1901–2010 or 1951–2010. This is as expected since trends over a shorter period have stronger potential for occurrence of pronounced temporary trends due to internal variability alone. Only 9% of the analyzed area has detectable and attributable anthropogenic influence (categories -3, -2, +2, +3), which represents less than one-third of the fractional areal coverage of such trends for 1901–2010 (29%). ... Eight percent of the analyzed area has attributable anthropogenic *increases* (categories +2, +3), including parts of eastern Europe, northern Asia, northern Australia/Maritime Continent, and tropical Africa.

As another example of overstating findings, NCA5's Chapter 2 page 18 states

There is robust evidence that human-caused warming has contributed to increases in the frequency and severity of the heaviest precipitation events across nearly 70% of the US.

This is allegedly attributed to two papers:

- Diffenbaugh, N.S., D. Singh, and J.S. Mankin, 2018: Unprecedented climate events: Historical changes, aspirational targets, and national commitments. *Science Advances*, 4 (2), 3354.
<https://doi.org/10.1126/sciadv.aao3354>

⁴ Quite separately we note that the attribution to "climate change" is misleadingly ambiguous. Because NCA5's Glossary defines "climate change" as a change in climate for any reason, the statement is a tautology and so the attribution is superfluous. But because the popular perception of climate change is anthropogenic, its gratuitous inclusion effectively attributes the changes to greenhouse gas emissions. [FIX FORMATTING HERE]

- Kirchmeier-Young, M.C. and X. Zhang, 2020: Human influence has intensified extreme precipitation in North America. *Proceedings of the National Academy of Sciences of the United States of America*, **117** (24), 13308-13313. <https://doi.org/10.1073/pnas.1921628117>

Diffenbaugh *et al.* presented ratios of observed occurrences of extreme events to simulated occurrence rates in CMIP6 models run with only natural forcings. They report that for 79% of the U.S. extreme rainfall event frequencies are currently higher than in model simulations, and the ratio of occurrences will rise under future warming simulations. This is not “robust” evidence of anthropogenic influence since it requires readers to assume that climate models provide accurate simulations of regional precipitation patterns, something that even IPCC AR6 admits is uncertain (AR6 WGI SPM Box SPM 1.2, SPM Section C.1.3).

Kirchmeier-Young and Zhang looked at extreme 1- and 5-day events in North America and, using three GCMs, found

A signal of combined anthropogenic and natural external forcing can be detected in the intensification of extreme precipitation at the continental scale over North America. In some cases, this intensification can be attributed to human influence specifically.”

However, they noted large differences among the three models in their simulated precipitation changes. Also, two of the three models failed to yield attribution for 5-day events for the North America mean. In other words the models disagreed on whether the observed changes were due to anthropogenic activity. Both cited references utilized the implausible RCP8.5 scenario and began their “historical” observational records only in 1961. Here again this is not “robust” evidence, it is merely suggestive, particularly since other studies have found natural variability predominant.

3.3 Technical example: Emergent constraints

Some of the overconfidence expressed by NCA5 arises by omitting discussion of counterevidence in the peer reviewed literature. An example is the topic of “emergent constraints”. Chapter 3 page 17 invokes this concept to support its claim that key uncertainties have been reduced:

An approach to reduce uncertainty in climate change projections has matured over the past decade. It is known as “emergent constraints.” The term refers to strong statistical relationships between highly uncertain future climate parameters and observable trends or variations in the current climate, along with a physical explanation of this relationship.

Emergent constraints appeared in the climate modeling literature as an attempt to tie GCM behavior to climate observations in hopes of generating insight into real-world ECS. Climate models exhibit a wide range of sensitivities. The idea of emergent constraints is to examine whether the models with shared sensitivity values also share a common representation of some climate process (usually related to clouds) that might indirectly influence ECS. Suppose, for instance, that in low-ECS models the total cloud fraction in the tropics is strongly correlated with that in the southern midlatitudes but in high-ECS models the correlation is weak. Then researchers could check if the observed correlation is strong or weak and draw a conclusion about which type of model, and therefore which ECS value, is more likely.

A problem in the emergent constraint literature is that there has been a proliferation of proposed correlations with little physical motivation. Many emergent constraints patterned on CMIP5 models failed to work on CMIP6 models (Schlund *et al.* 2020)⁵. In other words, the observed correlations in CMIP5 models between ECS and cloud processes failed to show up in CMIP6 models, indicating that they were likely spurious rather than clues to physical processes governing the Earth climate system. The result was that emergent constraints estimated from CMIP5 models widened the range of estimated ECS values when applied to CMIP6 models.

Schlund *et al.* summarized the problem as follows [**boldface** used for emphasis]

In this study, we systematically analyze 11 published emergent constraints on ECS that have mostly been derived from models participating in the Coupled Model Intercomparison Project Phase 5 (CMIP5) project... The focus of the study is on testing if these emergent constraints hold for [Earth System Models] participating in the new Phase 6 (CMIP6). Since none of the emergent constraints considered here have been derived using the CMIP6 ensemble, CMIP6 can be used for cross-checking of the emergent constraints on a new model ensemble. **The application of the emergent constraints to CMIP6 data shows a decrease in skill and statistical significance of the emergent relationship for nearly all constraints, with this decrease being large in many cases.** Consequently, the size of the constrained ECS ranges (66% confidence intervals) widens by 51% on average in CMIP6 compared to CMIP5.

Yet NCA5 described the use of emergent constraint analysis as a great “advance” that reduced uncertainty.

⁵ Schlund, Manuel, Axel Lauer, Pierre Gentine, Steven C. Sherwood, and Veronika Eyring (2020) Emergent constraints on equilibrium climate sensitivity in CMIP5: do they hold for CMIP6? *Earth System Dynamics* 11 1233-1258 <https://doi.org/10.5194/esd-11-1233-2020> [Need to be consistent on where references go]

4 RELIANCE ON *Ad Hoc* TIME SCALES FOR TREND ANALYSIS

In CWG25 Chapter 6 we discussed the need for care in the choice of time scale when making claims about trends in extreme weather. We gave examples from analysis of river flooding (6.1), heatwaves (6.3), and extreme precipitation (6.4) to show how assertions about apparent trends based on short data sets fall apart when looking at longer versions of the same data sets. Here we elaborate on these examples to illustrate the general point that NCA5 made inconsistent and *ad hoc* choices about time scales of analysis, weakening the validity of their conclusions.

McKittrick and Christy (2019)⁶ showed that apparently significant positive trends in U.S. average and extreme precipitation over the NCA4 interval (1901 – 2016) disappeared on longer samples (extending back as far as the 1840s, depending on location) or on a shorter interval coinciding with the final 40 years of the data then available (1978 – 2017).

In CWG Section 6.4 we presented analyses of updated data for the same locations (and many others), in all cases finding both considerable regional heterogeneity and that trends detectable on one time scale are often not detected on longer or shorter time scales. These findings argue against simple attribution of changes to anthropogenic influences.

4.1 Average and Extreme Precipitation

Under Key Message 2.2 “Extreme Events Are Becoming More Frequent and Severe” (p. 2-16) NCA5 states (p. 2-18):

Rainfall is becoming more extreme

Since the 1950s, there has been an upward trend in heavy precipitation across the contiguous US. This increase is driven largely by more frequent precipitation extremes, with relatively smaller changes in their intensity.

NCA5 did not continue the NCA4 precedent of using the post-1901 interval as the time scale for its precipitation discussion, instead it refers to changes “since the 1950s”; NCA5 Figure 2.8 suggests 1958 as the start date. For the present report we have extended the CWG25 analysis even further to include 141 stations across the US in the Pacific Coast, Midwest, Northeast and Southeast regions. We provide details in Appendix 3; here we note merely that once again it is possible to find trends that support the NCA5 position, but they are not robust to selecting longer or shorter time scales of analysis. Data from 1950 to 2024 yields many indications of increased average and extreme precipitation at individual stations and region-wide averages. But when using the entire data set (back to the 1890s or earlier depending on location) or the later subset (1980 to 2024) the trends become smaller, in many cases they become statistically insignificant, and occasionally they even change sign. Only in the Northeast region are the post-1950 trends robust to also focusing on the post-1980 interval.

The following is a more accurate summary of what U.S. data show.

⁶ McKittrick, R., and J.R. Christy (2019). Assessing changes in US regional precipitation on multiple time scales. *Journal of Hydrology*, 578, 124074. <https://doi.org/10.1016/j.jhydrol.2019.124074>

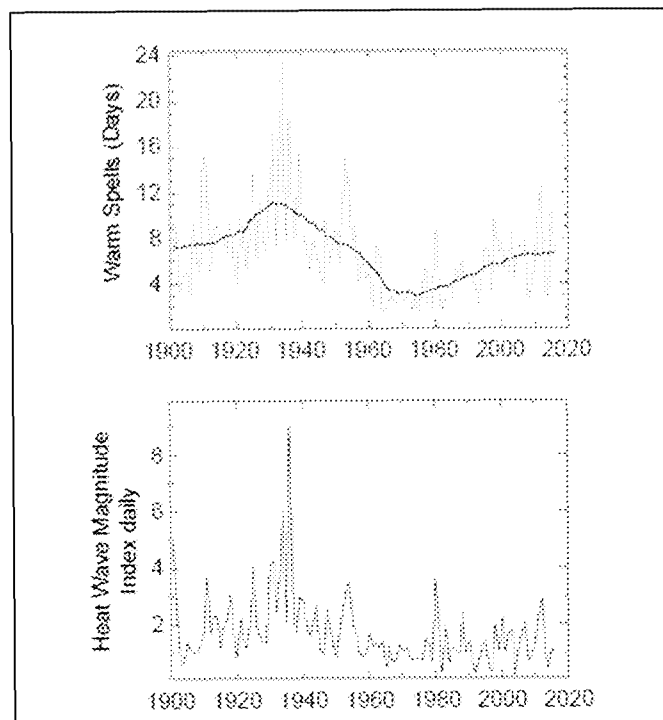
There are regionally heterogeneous changes in average and extreme precipitation. Positive trends in annual average rainfall and extreme events (defined either as the annual maximum or the number of exceedances of the 99th percentile value) are generally weak or non-existent when looking at samples exceeding 130 years in length. Significant trends can be found when beginning the sample in the 1950s although in most cases the trends weaken and become insignificant when looking at the post-1980 interval. This makes attribution to anthropogenic warming difficult.

4.2 Heatwaves

In contrast to NCA5, NCA4 examined heat extremes across the whole of the 20th century, pointing out that peak heat wave activity was reached in the 1930s and has decreased since then, and that recent increases are confined to areas west of the Rockies:

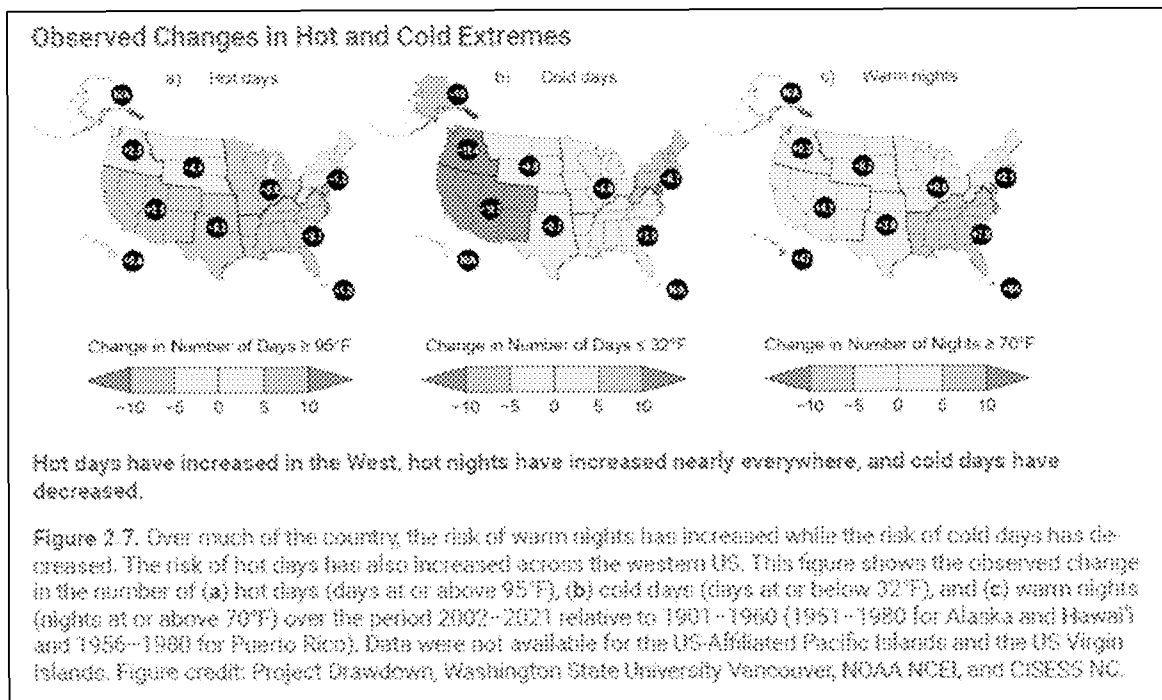
[The] warmest daily temperature of the year increased in some parts of the West over the past century, but there were decreases in almost all locations east of the Rocky Mountains. In fact, all eastern regions experienced a net decrease, most notably the Midwest (about 2.2°F [1.2°C]) and the Southeast (roughly 1.5°F [0.8°C]).

Since the mid-1960s, there has been only a very slight increase in the warmest daily temperature of the year (amidst large interannual variability). Heat waves (6-day periods with a maximum temperature above the 90th percentile for 1961–1990) increased in frequency until the mid-1930s, became considerably less common through the mid-1960s, and increased in frequency again thereafter. As with warm daily temperatures, heat wave magnitude reached a maximum in the 1930s. (NCA4 pp. 190-191)



U.S. Heat waves since 1900. Source: NCA4 Figure 6.4

Contrast this careful and factual language with NCA5 Key Message 2.2: “Extreme Events Are Becoming More Frequent and Severe.” This blanket statement is followed by NCA5 Figure 2.7 (reproduced below) which shows the number of hot days, cold days and warm nights (respectively in panels a—c) over the period 2002–2021 compared to 1901–1960. [Presumably these are annual counts, although not stated in the caption.]



Close inspection shows that this figure contradicts the NCA5 Key Message with respect to heatwaves and instead reinforces the position of NCA4. Notwithstanding Key Message 2.2 the leftmost panel shows that over most of CONUS the number of extreme heat days has decreased in recent decades compared to the prior century.

The accompanying discussion in NCA5 becomes convoluted as it appears to be aimed at supporting the Key Message despite the contrary evidence. NCA5 chapter 2 elaborates on Key Message 2.2 by saying (page 16):

Observations show an increase in the severity, extent, and/or frequency of multiple types of extreme events. Heatwaves have become more common and severe in the West since the 1980s (*high confidence*).

But it fails to mention the decline elsewhere. Instead, it says on the next page (page 17):

By some measures, the most extreme heatwaves on record in the United States occurred during the Dust Bowl era of the 1930s. ... Globally such heatwaves are becoming more frequent, and in recent decades the western United States has been following those trends.

The reference to a global trend seems to be an attempt to tie heatwaves to climate change. But the obvious question, unaddressed by NCA5, is why it holds for only part of the U.S. while most of the country is trending in the opposite direction. These issues are addressed in Chapter 6 of CWG25, demonstrating that the range and magnitude of extreme temperatures (10s of degrees) are driven more by natural variability than by the small anthropogenic forcing. The analysis in CWG25 shows that for both (a) hot days ($\geq 95^{\circ}\text{F}$) and (b) number of days in heatwaves, the current decade is no hotter than a century ago. For example, during the 30-year period 1925-1954 (only 23% of the 1899-2024 data record), CONUS experienced 33% of the total heat wave days and during the most recent 30 years it experienced 24%, almost exactly that expected by chance. Thus, the NCA5 claim that “multiday heatwaves have become hotter, more frequent, larger, and longer lasting in recent decades,” is simply false when expanding the temporal and spatial domains to encompass all available data (Chapter 6 and Figure 6.3.6 of CWG25).

NCA5 then pointed to the dramatic Pacific Northwest heatwave of 2021. CWG Section 8.6.1 discussed this event in detail, reviewing the multiple peer reviewed studies that explained the unusual meteorological context was unrelated to climate change, a point omitted from the NCA5 discussion.

NCA5 finally turns to the declining heatwave trend in CONUS east of the Rockies but attempts to reframe it by focusing on urban warm spells.

[The] number of very hot days has actually decreased across the central and eastern regions due to summer cooling trends in the region (Figure 2.7; Ch. 22). This does not, however, mean the central and eastern US are not affected by heat. The impacts of extreme high temperatures are more severe if such conditions persist for several days, and overall, multiday heatwaves have become hotter, more frequent, larger, and longer lasting in recent decades. Across 50 large US cities, the US Global Change Research Program heatwave indicator (<https://www.globalchange.gov/indicators/heat-waves>) shows that the average number of heatwaves has doubled since the 1980s, and the length of the heatwave season has increased from about 40 days to about 70 days.

We discussed this issue in CWG25 Section 6.3. The figure referenced by NCA5 uses an *ad hoc* definition of heat wave, namely two consecutive days with minimum nighttime temperatures above the 85th percentile, and an *ad hoc* time scale which begins in the 1960s, the coldest decade in the last century, thus suppressing any comparison to the 1930s. Further, nighttime temperatures in urban areas have gone up faster than daytime temperatures (which NCA5 acknowledges), but this is a signature of urban heat islands and not a good metric of climate change. CWG25 noted as well that the occurrence of hot days ($\geq 95^{\circ}\text{F}$) has recently increased in the West, but declined in the remainder of the country, and in the nationwide average, since 1899.

5 INADEQUATE TRACEABLE ACCOUNTS

NCA3 began the practice of including a section on Traceable Accounts at the end of each chapter. This is the description from NCA5:

Each chapter concludes with a section entitled Traceable Accounts, which provides information on the overall process used to develop the chapter as well as a separate Traceable Account section for each Key Message. These Traceable Accounts describe the supporting evidence behind each Key Message, the process and rationale authors used in reaching their conclusions, and the author team's expert assessment of the confidence in and, where applicable, likelihood of these conclusions. As such, Traceable Accounts provide information about the state of the science, document sources of uncertainty, identify research gaps, and allow traceability to data and resources.

The Traceable Accounts for each chapter and Key Message includes the following sections:

- Description of Evidence Base
- Major Uncertainties and Research Gaps
- Description of Confidence and Likelihood

The Traceable Accounts could in principle address the statutory requirement that the NCA discuss scientific uncertainties. They could also help satisfy the Executive Order for Restoring Gold Standard Science by addressing reproducibility, transparency, communication of error and uncertainty, and skepticism of findings and assumptions. However, the Traceable Accounts in NCA5's Chapters 2 and 3 (the only chapters investigated here) uneven, often superficial and noninformative.

An example of a deficient Traceable Account is NCA5's Key Message 2.2: "Extreme Events are Becoming More Frequent and Severe". The "Description of the Evidence Base" offers two paragraphs, the first summarizing the findings and the second generically describing the types of data that can be used for storms. "Major Uncertainties and Research Gaps" focuses on the uneven distribution across U.S. populations due to differences in exposure and vulnerability. The only limitations in data referred to are the lack of a long-term record of lightning and the lack of homogenized daily and hourly temperature data apart from reanalysis products.

But the most astonishing deficiency is in the "Description of Confidence and Likelihood." One of the statements in Key Message 2.2 is:

Hurricanes have been intensifying more rapidly since the 1980s (high confidence) and causing heavier rainfall and higher storm surges (high confidence).

The Description of Confidence and Likelihood includes the following statement:

Basic physical understanding and climate models both provide robust explanations for the links between climate change and observed changes in these extremes: this is why the authors also have high confidence that storms are delivering more rainfall and high confidence that storm surges are becoming higher.

No reference to journal publications or a specific data set is made in the Chapter regarding hurricane induced precipitation or storm surge to support this *high confidence* conclusion.

The Traceable Accounts for the various Key Findings of Chapter 3 have some substantial inconsistencies. Consider

Key Message 3-1: Human activities have caused global warming.

Confidence and Likelihood: “There is *very high confidence* that emissions of GHGs from human activities, fossil fuel use in particular, have *unequivocally* caused all global warming observed over the industrial era. There is also *very high confidence* that changes in natural climate drivers have had globally small and regionally variable long-term effects over this period.”

The Uncertainties section addresses only uncertainties in radiative forcing by greenhouse gases. In contrast, the Traceability Analysis of Key Message 3-4 (“Humans Are Changing Earth System Processes”) is arguably the most scientifically credible text in the entire Chapter. From its Description of Evidence Base:

In the last decade, there has been increasing recognition of the role of regional-scale natural variability in the past and future evolution of climate, as well as the fact that regional natural variability signals can be competitive with forced anthropogenic signals.

And from its Major Uncertainties and Research Gaps:

For example, the true natural variability of the climate system on decadal to centennial timescales could be larger than what we estimate from GCMs, which would further increase the irreducible uncertainty stemming from natural variability.

There is also a generic problem in tracing NCA5’s Traceable Accounts. The Front Matter of NCA5 states:

Each figure and some tables are accompanied by a metadata survey, which can be accessed in the online version of the report by clicking on the eyeball icon above the figure or table (see the table below for explanations of additional icons used throughout the report). The metadata survey describes data sources, figure or table development methods, copyright information, and other important documentation.

Upon clicking on the eyeball icon above a particular figure, a “Contact Us” email appears, addressed to the USGCRP. No attempt was made to send a email to elicit the Metadata information, but it is clear that this information is not readily accessible online.

In summary, the Traceable Analyses examined here, with few exceptions, fail to meet the stated objectives set forward by the NCA.

6 OVEREMPHASIS ON EXTREME SCENARIOS

To respond to the GCRA mandate to “project major trends for the subsequent 25 to 100 years,” NCA5 relies on projections of future climate change based on estimates of future emissions (the so-called SSP scenarios) and/or specified levels of radiative forcing (the RCP scenarios). For the most part, NCA5 uses scenarios developed for the IPCC Assessment Reports.

In CWG Section 3.2.1 we presented a critical assessment of past and current IPCC scenario envelopes, showing that they have tended to overshoot observed emissions. The IPCC AR6 published in 2021 stated that “The likelihood of high-emission scenarios like RCP8.5 and SSP5-8.5 is considered low in light of recent energy sector developments.” and that same year UN Climate Negotiators (COP) stopped using scenarios above 4.5.

NCA5 makes the following observations about the scenarios they use:

NCA5 authors were advised to assess the full range of scenarios available. (Front Matter)

Scenarios of future emissions and land-use change are developed as plausible alternatives, but no relative likelihood is attached to them. Some recent studies, however, have argued that the highest scenario, SSP5-8.5, is no longer plausible without a reversal of current trends in the adoption of renewables and energy efficiency. (Key Message 3.3 Traceable Analysis)

Despite acknowledging the issue, NCA5 otherwise ignored the problem. A keyword search of NCA5 of mentions of RCP/SSP scenarios finds over 50% referred to the extreme emissions scenarios RCP8.5/SSP5-8.5. Further, 10 NCA5 figures (5.2, 6.9, 7.4, 11.3, 14.6, 22.13, 22.19, 27.9, 29.13) included *only* the 8.5 scenarios:.

The problem of relying on extreme scenarios is particularly acute for NCA5’s sea level rise projections. The sea level rise scenarios used in NCA5 do not relate directly to the SSP emissions scenarios, but rather to specified amounts of sea level rise by 2100. Table 4 of NCA5’s “Guide to Using this Report” reproduced below shows that Low relates to 0.3 m (0.98 feet), Intermediate-Low relates to 0.5 m (1.64 feet), Intermediate relates to 1.0 m (3.28 feet), Intermediate-High relates to 1.5 m (4.92 feet), and High relates to 2.0 m (6.56 feet).

Table 4. Descriptive Terms for Common Sea Level Rise Scenarios Used in NCA5						
Future global mean sea level rise and sea level rise along United States coastline are shown for five scenarios in feet (and meters), relative to a 2000 baseline. The US values shown in the right half of the table are averaged across the US coastal regions, including the contiguous US, Alaska, Hawaii and the US-Affiliated Pacific Islands, and the US Caribbean. The national values shown in the table differ substantially from regional values. For example, sea level rise is higher in the Gulf Coast and lower or even negative in some parts of Alaska. In the next 30 years (2020–2050), sea level along the contiguous US coasts is expected to rise 0.92 feet (0.28 m), the same amount of sea level rise observed over the last 100 years (1920–2020). See Chapter 9 for regional sea level information. Adapted from Sweet et al. 2022. ¹						
Sea Level Rise Scenario Descriptors	Global Mean Sea Level			United States		
Year	2050	2100	2150	2050	2100	2150
Low	0.49 (0.15)	0.98 (0.3)	1.31 (0.4)	0.59 (0.18)	0.98 (0.3)	1.64 (0.5)
Intermediate-Low	0.66 (0.20)	1.64 (0.5)	2.62 (0.8)	0.75 (0.23)	1.64 (0.5)	2.95 (0.9)
Intermediate	0.92 (0.28)	3.28 (1.0)	6.23 (1.9)	0.89 (0.27)	3.28 (1.0)	6.89 (2.1)
Intermediate-High	1.21 (0.37)	4.92 (1.5)	8.86 (2.7)	1.12 (0.34)	4.92 (1.5)	8.86 (2.7)
High	1.41 (0.43)	6.56 (2.0)	12.14 (3.7)	1.38 (0.42)	6.56 (2.0)	12.46 (3.8)

CAPTION NEEDED

Considering only projections representing processes quantified with at least medium confidence, IPCC AR6 assessed global mean sea level projections for 2100 to fall between 0.2 and 1.6 m (5th—95th percentile range). Nevertheless, the range of sea level rise scenarios considered by NCA5 extends to 2.0 m. Further, NCA5 fails to include plausible lower scenarios, such as 0.2 m cited by the IPCC, which also corresponds to the average rate of sea level rise over the past century.

Chapter 9 of NCA5 offers the following predictions of sea level rise:

“Under a range of potential global warming levels, average sea level along US coastlines is *likely* to be between 12 and 20 inches above 2000 sea levels in 2050 (Figure 9.2).”

These values span from the Intermediate scenario to values slightly greater than the High scenario. They can be put into context by considering the observed global sea level rise from 2000-2024, approximately 3.39 inches (0.28 feet). NCA5 is thus projecting a sea level rise during 2025 and 2050 that is 3.5 to 5.8 times the rate observed during 2000-2024. Chapter 9 further states:

“Looking toward the future, an 11 inch (28 cm) average rise along the contiguous US coastline is expected by 2050 (relative to 2020), with a *likely* range of 9-13 inches.”

...
 “There is *high confidence* and it is *likely* that sea levels will rise about 11 inches (likely range of about 9–13 inches) between 2020 and 2050”

In summary, NCA5 presents future sea level rise scenarios that are not directly relatable to either SSP/RCP emissions scenarios nor to global warming levels. The NCA5 scenarios include two scenarios that are higher than the 95th percentile for the extreme emissions scenario RCP8.5 and include hypothesized ice sheet processes in which there is low confidence. Projections to 2050 require rates of sea level rise from 2025 to 2050 that are more than tripe the rate observed during 2020-2024. Further, NCA5 ascribes *high confidence* to these sea level rise projections.

More generally, NCA5's inclusion, and even focus, on implausible extreme emissions scenarios supports projections of alarming impacts that are very unlikely to be driven by anthropogenic warming.

7 INADEQUATE NASEM REVIEW: TO BE ADDED

The National Academies of Science, Engineering and Medicine (NASEM) undertook a detailed review of the draft NCA5 (NASEM 2023).⁷ While they raised some of the concerns we have articulated herein their review is superficial overall and appears to be written by authors who share many of the biases of the NCA5 team. There is an inordinate focus on social and policy issues (e.g., every chapter is assessed under the heading "Comments on Equity and Justice"), rather than on the underlying science. In our assessment NASEM failed to apply the serious rigor one would expect. A few extracted comments from it will illustrate. Note that NASEM review comments are included here in blue font for reference.

7.1 Substantive criticisms by NASEM

- summarize the valid points made by NASEM and check the NCA replies

7.2 Failures to challenge NCA5 flaws

NASEM praised Chapter 2, saying:

The chapter [2] meets the requirements of Section 106 of the GCRA.

Yet contrary to the requirements of Section 106 NCA5 did not discuss natural variability let alone assess the full climate record available for quantifying natural variability. Chapter 2 actually minimizes natural variability by claiming (unsubstantiated) skill in attributing recent extremes to human causes. For example NCA5's Chapter 2 Introduction states,

"...recent advances in attribution science (KM 3.3) mean that the role of climate change in some extreme events can now be quantified in real time. For example, climate change made the record-breaking Pacific Northwest heatwave of June 2021 2° to 4°F hotter, and in 2017 ..."

CWG25 reviews the expert literature demonstrating that this particular event would have happened with or without climate change and that for CONUS, hot extremes are no more frequent now than they were in the past. NASEM did not challenge the unsubstantiated attribution claims in NCA5.

Notwithstanding NASEM's claim that the Chapter complies with Section 106 of the GCRA it then acknowledged the absence of discussion of natural variability:

⁷ National Academies of Sciences, Engineering, and Medicine. 2023. *Review of the Draft Fifth National Climate Assessment*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/26757>.

...the discussion and references regarding the role of natural climate variability and its regional differences are missing.

While a nod to natural variability is occasionally found in NCA5, it is usually followed by a “however” to emphasize human influence. One example is the statement just before the claim mentioned above pertaining to extreme event attribution: “There has always been extreme weather, which occurs even in an unchanged climate due to the natural variability of the Earth system. However, recent advances in attribution science (KM 3.3) mean that the role of climate change in some extreme events can now be quantified in real time...”

We pointed out that the evidence regarding heatwaves directly contradicts Key Message 2.2. NASEM did not mention this, instead it focused on a somewhat esoteric issue of terminology:

“Extreme Events Are Becoming More Frequent and Severe.”

Key Message 2.2 is another generally well written key message. However, while the title of this key message includes the word “risk,” the key message is exclusively about hazard. The Committee suggests rewriting the key message title to more accurately reflect the discussion on hazards.

The NASEM review appears to accept NCA5’s use of short data records because it makes no critical remarks about the failure to assess long time series, except for its observation that the use of short records makes the omission of natural variability that much more of a problem:

It is also important to point out that the influence of natural climate variability becomes particularly strong when the climate trend is computed based on short periods of time or small geographic areas.

This comment was largely ignored in the NCA5 final text.

In sum, while the NASEM review might bestow the Academies’ imprimatur on the NCA5 report, it does not necessarily add to its quality for two reasons. As we have demonstrated, the NASEM review falls short in rigor and completeness. And second, the NCA authors are not obligated to follow the NASEM recommendations in crafting their final product.

8 SUMMARY EVALUATION OF NCA5

The most straightforward evaluation of NCA5 is through its statutory requirements. While it is not within our purview to make definitive rulings on compliance, we believe there are several important aspects to consider when evaluating NCA5 against its statutory requirements. Add text per Seth's letter ...

Our expertise in climate science, the foundational area covered by NCA5, allows a different perspective, one that finds the coverage unbalanced and selective. Our review has identified numerous instances where NCA5 falls short of the quality and integrity expected of scientific document of this importance. Furthermore, our examination suggests that the entire process—from the selection of contributing authors to the handling of expert reviews—appears to have been systematically biased toward reinforcing predetermined conclusions and amplifying alarmist messaging rather than presenting a balanced scientific assessment. In short, NCA5 was written to persuade, not inform.

A third perspective for evaluating NCA5 is that of citizens interested in good policymaking. The changing climate is a legitimate public concern, as are concerns about cost of living, economic growth, employment opportunities, and other socioeconomic factors. We share the widespread belief that elected officials should have access to the highest quality information when crafting energy and climate policy decisions that must balance multiple concerns. From this perspective, NCA5 is a missed opportunity. What could have been a valuable contribution to informed tradeoffs instead became a misleading advocacy document that corrupts the policymaking process.

APPENDICES

APPENDIX 1: Charge to the review

APPENDIX 2: statutory requirements for NCA5

APPENDIX 3: Analysis of U.S. Longterm Precipitation Records

[I'm not sure we need both the tables and multipanel figures here. Is anyone really going to look at the tables? Perhaps they can be eliminated and just keep the figures?]

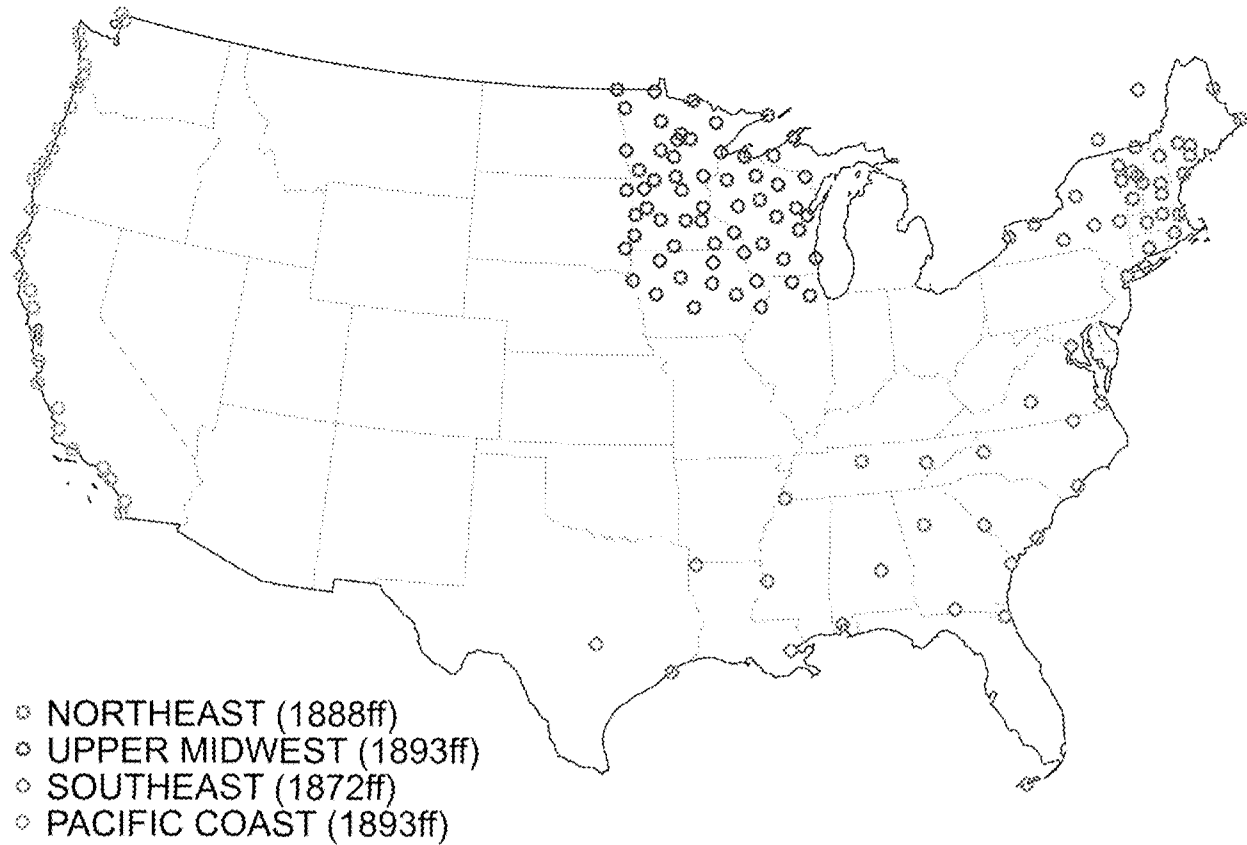


Figure. Stations used in the following analyses.

Table codes: (-) neg insignificant, -- neg significant, (+) pos insignificant, ++ pos significant.

Column 1: Measure

Column 2: Number of stations in that region

Column 3: Count of stations exhibiting a significant positive trend

Column 3: Count of stations exhibiting a significant negative trend

Column 5: Characteristic of region-wide trend

PACIFIC COAST

Since 1893:

	No. stns	+ trends	- trends	region
1-day average	29	0	1	(-)
2-day average	29	0	1	(-)

Avg on non-zero days	29	0	9	--
Variability	29	1	0	(+)
Annual max	29	2	1	(+)
Number of 99 th pct exceedances	29	1	0	(-)

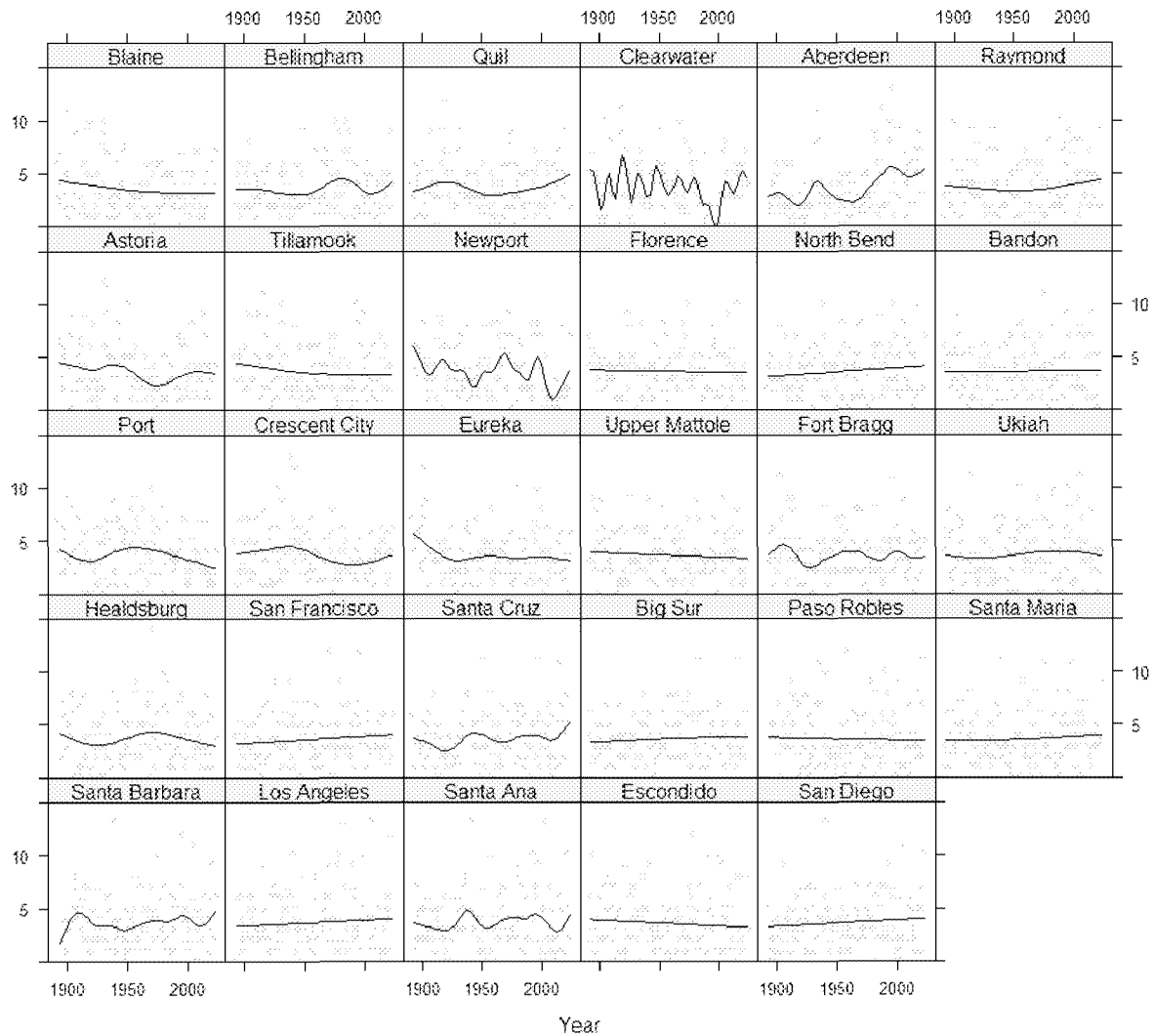
Since 1950:

	No. stns	+ trends	- trends	region
1-day average	29	0	1	(-)
2-day average	29	0	1	(-)
Avg on non-zero days	29	0	4	(-)
Variability	29	2	3	(-)
Annual max	29	6	3	(-)
Number of 99 th pct exceedances	29	2	1	(-)

Since 1980:

	No. stns	+ trends	- trends	region
1-day average	29	0	0	(-)
2-day average	29	0	0	(-)
Avg on non-zero days	29	0	1	(-)
Variability	29	0	0	(-)
Annual max	29	2	1	(-)
Number of 99 th pct exceedances	29	0	0	(+)

Annual No. 99th Percentile Exceedances PC 1893-2024



SOUTHEAST

Since 1873:

	No. stns	+ trends	- trends	region
1-day average	24	1	1	(+)
2-day average	24	1	1	(+)
Avg on non-zero days	24	7	2	(+)
Variability	24	1	0	(+)
Annual max	24	2	0	(+)
Number of 99 th pct exceedances	24	5	0	(+)

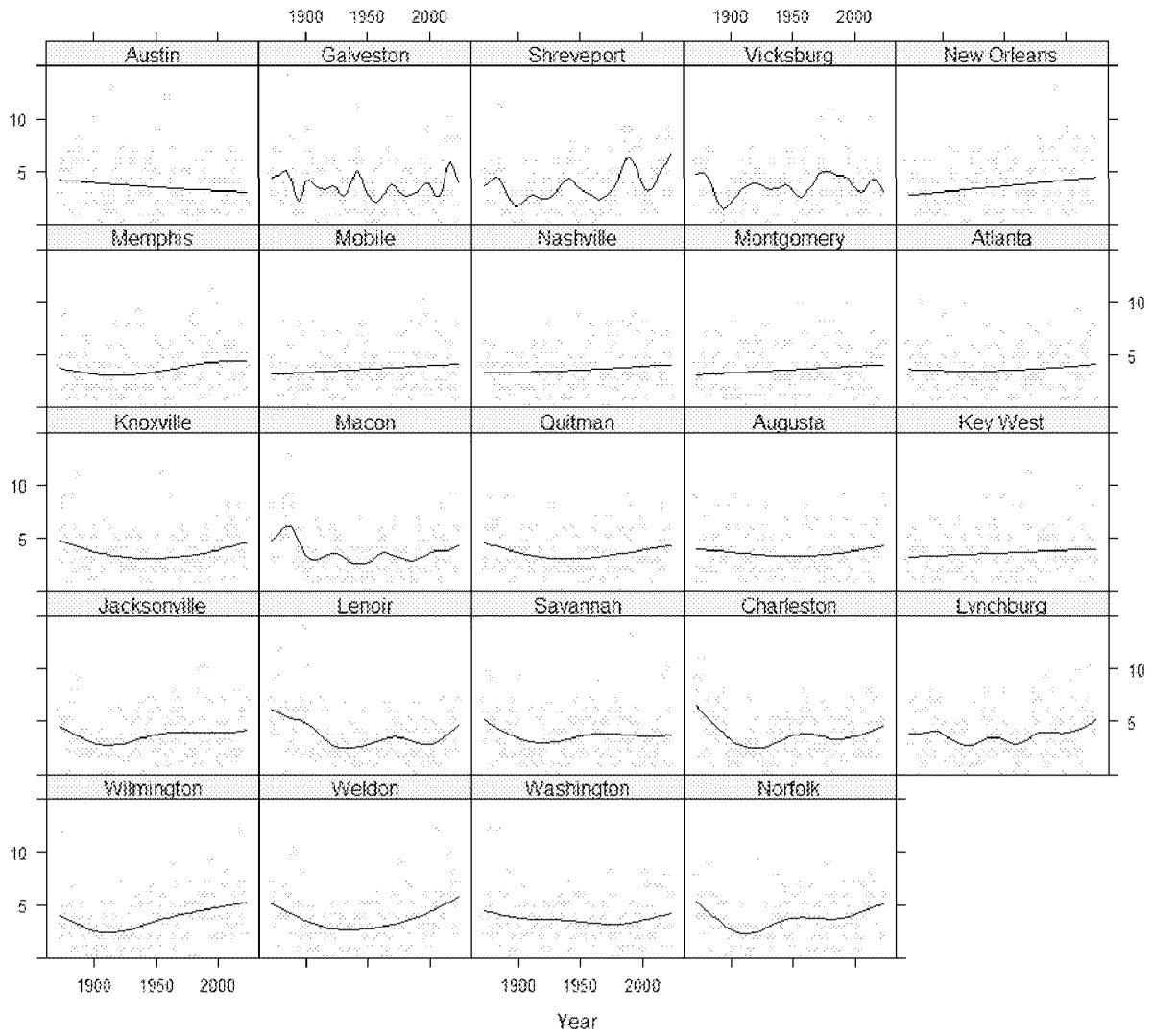
Since 1950:

	No. stns	+ trends	- trends	region
1-day average	24	5	0	++
2-day average	24	5	0	++
Avg on non-zero days	24	5	1	++
Variability	24	6	0	++
Annual max	24	4	0	++
Number of 99 th pct exceedances	24	4	0	(+)

Since 1980:

	No. stns	+ trends	- trends	region
1-day average	24	5	0	(+)
2-day average	24	5	0	(+)
Avg on non-zero days	24	5	1	(+)
Variability	24	3	0	(+)
Annual max	24	4	0	(+)
Number of 99 th pct exceedances	24	4	0	(+)

Annual No. 99th Percentile Exceedances SE 1873-2024



MIDWEST

Since 1893:

	No. stns	+ trends	- trends	region
1-day average	61	23	0	++
2-day average	61	23	0	++
Avg on non-zero days	61	2	12	(+)
Variability	61	12	0	++
Annual max	61	9	0	(+)
Number of 99 th pct exceedances	61	10	0	(+)

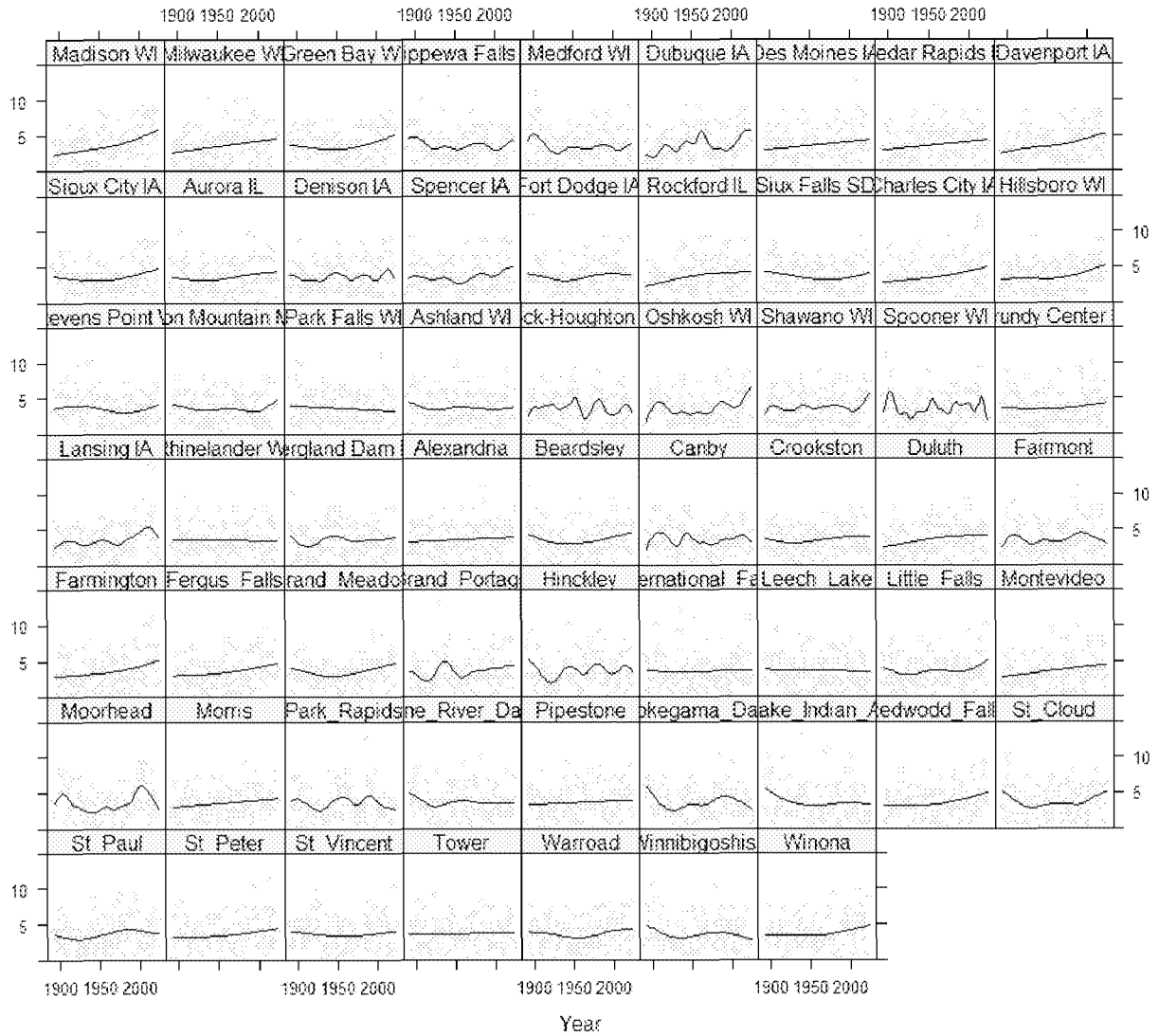
Since 1950:

	No. stns	+ trends	- trends	region
1-day average	61	28	2	++
2-day average	61	28	2	++
Avg on non-zero days	61	11	1	++
Variability	61	16	0	(+)
Annual max	61	8	0	(+)
Number of 99 th pct exceedances	61	19	0	++

Since 1980:

	No. stns	+ trends	- trends	region
1-day average	61	6	1	(+)
2-day average	61	6	1	(+)
Avg on non-zero days	61	8	2	(+)
Variability	61	5	1	(+)
Annual max	61	0	1	(+)
Number of 99 th pct exceedances	61	5	3	(-)

Annual No. 99th Percentile Exceedances MW 1893-2024



NORTHEAST

Since 1888:

	No. stns	+ trends	- trends	region
1-day average	27	12	0	++
2-day average	27	12	0	++
Avg on non-zero days	27	7	1	(+)
Variability	27	4	0	(+)
Annual max	27	3	0	(-)
Number of 99 th pct exceedances	27	5	0	(+)

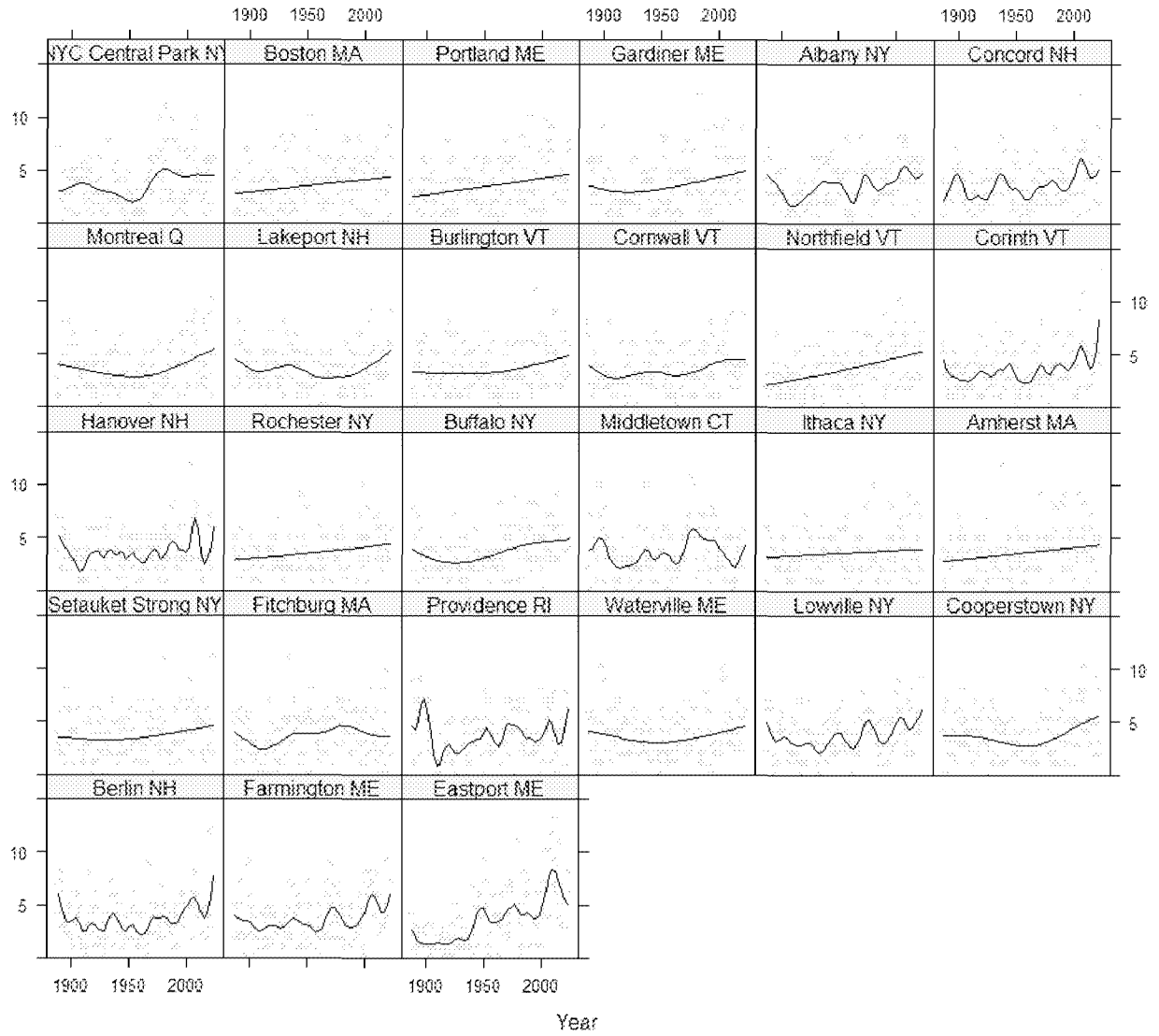
Since 1950:

	No. stns	+ trends	- trends	region
1-day average	27	12	0	++
2-day average	27	12	0	++
Avg on non-zero days	27	7	1	(+)
Variability	27	4	0	(+)
Annual max	27	3	0	(-)
Number of 99 th pct exceedances	27	5	0	++

Since 1980:

	No. stns	+ trends	- trends	region
1-day average	27	10	1	++
2-day average	27	10	1	++
Avg on non-zero days	27	6	0	(+)
Variability	27	2	0	(+)
Annual max	27	1	0	(+)
Number of 99 th pct exceedances	27	1	1	++

Annual No. 99th Percentile Exceedances NE 1888-2024



ABOUT THE AUTHORS

[Insert updated bios]

From: Roy Spencer <roywspencer@hotmail.com>
Sent: Monday, July 7, 2025 3:25 PM
To: Steven Koonin; 'John Christy'
Cc: 'Travis Fisher'; 'Josh Loucks'; 'Seth Cohen'; 'Ross McKitrick'; 'Judith Curry'
Subject: RE: the latest from Joselow

Ha! I wouldn't bet against that!

Sent from my Verizon, Samsung Galaxy smartphone

----- Original message -----

From: Steven Koonin <steven.koonin@gmail.com>
Date: 7/7/25 2:23 PM (GMT-06:00)
To: 'John Christy' <climateman60@gmail.com>, 'Roy Spencer' <roywspencer@hotmail.com>
Cc: 'Travis Fisher' <travis.scott.fisher@gmail.com>, 'Josh Loucks' <loucksj14@gmail.com>, 'Seth Cohen' <Seth.cohen@hq.doe.gov>, 'Ross McKitrick' <ross.mckitrick@gmail.com>, 'Judith Curry' <curry.judith@gmail.com>
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And shall we have a pool about whether she ties it to current weather events; e.g., "With the nation ravaged by weather extremes, a group of scientists is working with the Trump Administration to ..."

SEK

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Here is Maxine's climate desk bio

<https://www.nytc.com/press/maxine-joselow-joins-climate-desk/>

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Maxine (NYTimes) called this morning. I hope she understood what "no comment" means.

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On Wed, Jul 2, 2025 at 11:10 AM Travis Fisher <travis.scott.fisher@gmail.com> wrote:

Please do not respond.

She has reached out to DOE as well, and the relevant folks here will respond (or not).

On Wed, Jul 2, 2025 at 11:14 AM Roy Spencer <roywspencer@hotmail.com> wrote:

Why respond at all? Once you engage, the questions will never end. Instead, let them report on what they **think** they know.

Unless we verify what she suspects, or unless she has reliable leaked information, she might be forced to use caveats.

-Roy

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This is what Maxine replied to my "pass" on an interview ... the plot thickens.

John, thank you for getting back to me, and no worries. I am planning to report in my article that you are listed as "Expert S" in the Department of Energy's internal email system. "Expert S" is usually reserved for detailees or short-term political appointees. I am also planning to report that the physicist Steve Koonin is leading a group of Energy Department employees who have been tasked with crafting a technical support document that justifies the repeal of the endangerment finding.

Do you have any comment on this information? Specifically, are you currently working for DOE, and have you been involved in crafting that technical support document?

Please let me know either way at your earliest convenience -- I can be reached via email or via cell at 202-948-1924 -- and thanks again for considering this request.

Best,
Maxine

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Climate Reporter
The New York Times
Cell: 202-948-1924
Signal: MaxineJ.55

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From: Maxine Joselow <maxine.joselow@nytimes.com>
Sent: Wednesday, July 2, 2025 10:10 AM
To: steven.koonin@gmail.com
Subject: Re: New York Times inquiry

Hi again, Steve,

I'm just following up on this inquiry. I'm planning to report that you're helping to lead a team of Energy Department employees who have been tasked with crafting a technical support document that justifies the repeal of the endangerment finding. Further, you are listed as a "special government employee" in the DOE internal email system.

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Thanks,

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On Tue, Jul 1, 2025 at 5:11 PM Maxine Joselow <maxine.joselow@nytimes.com> wrote:

Hi Steve,

I hope this email finds you well. This is Maxine Joselow, a climate reporter for the New York Times. We previously spoke when I was at the Washington Post. I'm working on a story about the Environmental Protection Agency's forthcoming proposal to repeal the endangerment finding for greenhouse gases. Would you have time to speak with me about this sometime on Wednesday (tomorrow)? And if so, could you remind me of your phone number? Please let me know when you get the chance, and thank you for considering this request.

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--

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Climate Reporter
The New York Times
Cell: 202-948-1924
Signal: MaxineJ.55

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Maxine

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Climate Reporter
The New York Times
Cell: 202-948-1924
Signal: MaxineJ.55

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Climate Reporter
The New York Times
Cell: 202-948-1924
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From: John Christy <climateman60@gmail.com>
Sent: Monday, July 7, 2025 2:28 PM
To: Roy Spencer
Cc: Travis Fisher; Steven Koonin; Josh Loucks; Seth Cohen; Ross McKittrick; Judith Curry
Subject: Re: the latest from Joselow

Maxine contacted me just now. Evidently the story will run very soon.

John C.

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I finally got an interview request from Mad Max.

Sent from my Verizon, Samsung Galaxy smartphone

----- Original message -----

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Date: 7/3/25 12:38 PM (GMT-06:00)
To: Travis Fisher <travis.scott.fisher@gmail.com>
Cc: Roy Spencer <roywspencer@hotmail.com>, Steven Koonin <steven.koonin@gmail.com>, Josh Loucks <loucksj14@gmail.com>, Seth Cohen <Seth.cohen@hq.doe.gov>, Ross McKittrick <ross.mckittrick@gmail.com>, Judith Curry <curry.judith@gmail.com>
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From: Steven Koonin <steven.koonin@gmail.com>
Sent: Thursday, July 3, 2025 2:43 PM
To: 'John Christy'; 'Travis Fisher'
Cc: 'Roy Spencer'; 'Josh Loucks'; 'Seth Cohen'; 'Ross McKittrick'; 'Judith Curry'
Subject: RE: the latest from Joselow

From <https://www.washingtonpost.com/people/maxine-joselow/> and <https://www.linkedin.com/in/maxine-joselow-2123b179/>:

Honors and Awards: Dateline Award from the D.C. Chapter of the Society of Professional Journalists, 2021

Professional Affiliations: Society of Environmental Journalists

Education: Brown University, BA in English (2016); Graduated with honors in nonfiction writing after completing an honors thesis

From: John Christy <climateman60@gmail.com>
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Judith Curry, President
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Cell: 202-948-1924
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To help protect
your privacy,
Microsoft Office
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automatic
download of this
picture from the
Internet.

Judith Curry, President
CFAN - Climate Forecast Applications Network
Reno, NV USA
curry.judith@cfanclimate.com | +1.404.803.2012
<http://www.cfanclimate.net>

From: Judith Curry <curry.judith@gmail.com>
Sent: Thursday, July 3, 2025 10:21 AM
To: John Christy
Subject: Re: the latest from Joselow

Is her phone # 202 948 1924. Just got a call and didn't pick up

On Thu, Jul 3, 2025 at 7:19 AM John Christy <climateman60@gmail.com> wrote:
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John C.

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To: Steven Koonin <steven.koonin@gmail.com>
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From: Steven Koonin <steven.koonin@gmail.com>
Sent: Wednesday, July 2, 2025 10:17 AM
To: 'Travis Fisher'; 'Josh Loucks'; 'Seth Cohen'
Cc: 'Ross McKittrick'; 'Judith Curry'; 'Roy W. Spencer'; 'John Christy'
Subject: the latest from Joselow

Importance: High

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From: John Christy <climateman60@gmail.com>
Sent: Sunday, August 3, 2025 3:40 PM
To: Steve Koonin
Cc: ross.mckittrick@uoguelph.ca; Judy Curry; Roy Spencer; Travis Fisher; Charles Park; Joshua Loucks; Seth Cohen; Audrey Barrios
Subject: Section 5.5 Stratosphere

All

I wanted to do my own check of stratospheric temperature trends. I first did this for a BAMS article in 2016 or so in which models and observations were in OK agreement globally.

Here are the latest lower stratospheric trends for 2000 to 2024, C/decade

Global

-0.05 CMIP-6 median trend

-0.05 Satellites (UAH, RSS, NOAA)

-0.01 Reanalyses (ERA5, JRAQ3)

Tropics

-0.01 CMIP-6

+0.09 Satellites

+0.13 Reanalyses

So, globally, the models DO agree with observations with updated data, and in the tropics they are a missing a bit. The point Santer makes is about fingerprinting, but the atmospheric response to extra CO₂ has always been known - cooling stratosphere (especially as one goes higher) and warming tropical troposphere. As I indicated earlier, the magnitude of the pattern is what the models are missing, though they get the fingerprint pattern fairly well.

The current wording pg 39 CWG.

A combination of tropospheric warming and stratospheric cooling is a commonly cited “fingerprint” of anthropogenic climate change. Stratospheric warming since 2000 coincides with continued surface and tropospheric warming, a pattern that is not found in climate model simulations and is not apparently consistent with the anthropogenic fingerprint.

Proposed when we get the reviews sorted out:

A combination of tropospheric warming and stratospheric cooling is a commonly cited “fingerprint” of anthropogenic climate change. Tropical lower stratospheric warming during 2000-2024 (+0.1 °C/decade) coincides with continued surface and tropospheric warming, a pattern that is not found in climate model simulations and is not apparently consistent with the anthropogenic fingerprint. Globally, model-average and observational trends of the lower stratospheric temperature since 2000 (a very small -0.05 °C/decade) are in agreement. In the middle and upper stratosphere, a region with very little atmospheric mass and little

connection to the troposphere, temperature responses are evident such as forced by the tiny variations in the 11-year solar cycle and with overall cooling due to changes in CO₂ and Ozone concentrations (Santer et al. 2023).

John C.

John Christy
Director, Earth System Science Center
Professor, Atmos and Earth Science
Alabama State Climatologist
The University of Alabama in Huntsville
climateman60@gmail.com

From: Judith Curry <curry.judith@gmail.com>
Sent: Sunday, June 8, 2025 3:00 PM
To: John Christy
Cc: Steve Koonin; Ross McKittrick; Roy W. Spencer; Travis Fisher; Josh Loucks; seth.cohen@hq.doe.gov
Subject: Re: June 7 NCA5 meeting follow up

Biased Selection of References is another candidate endemic topic

On Sun, Jun 8, 2025 at 11:00 AM John Christy <climateman60@gmail.com> wrote:
Steve

The example of Pielke Jr, an internationally recognized expert on the topic for which his is brushed aside, points out what I've seen since being a key contributor on the 1992 IPCC report through being a Lead Author in 2001 and the many other climate panels with which I've had experience. It's a people problem. There is a sort of syndrome that develops in which authors who are selected for important projects somehow feel ordained with the "authority of the last word." I've found that those with least expertise have been most susceptible to this disease - and it points to a failure of skeptical peer review. At a minimum we can point out a couple of NCA5 examples but also demonstrate that we don't think of ourselves as the final word on climate science, that we welcome criticism and are willing to rewrite as needed. In truth, our ignorance of the climate system is enormous, and we are simply trying to get as far up as we can on the "what-we-actually-know" ladder that sits in a pool ignorance in which swim media-hype, career aspirations and political agendas. There are certainly more rungs above us to climb and we hope we can make a little progress in the upward direction.

John C.

John Christy
Director, Earth System Science Center
Professor, Atmos and Earth Science
Alabama State Climatologist
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climateman60@gmail.com

On Jun 8, 2025, at 11:21 AM, Steven Koonin <steven.koonin@gmail.com> wrote:

Yes, endemic topics would be best if it can work. We could also then note how revealing it is when you re-read it having been sensitized to these deficiencies. We could also note these deficiencies (I'd really like to call them errors) are not subtle, but are elementary enough that they must be deliberate. And express surprise that they got by the NASEM review (or, if they were called out by NASEM, that USGCRP didn't correct them).

For the “short timelines”, I think it would be better termed “Obscuring Historical Observations”. That would include the short timelines, but also averaging the past in such a way as to minimize past variability (e.g., the temperature discussion of Fig 1.1a compares 2002-2021 with the average of 1901-1960

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Subject: Re: June 7 NCA5 meeting follow up

Hi John, after thinking about this some more, Ross' suggestion about tying all these into endemic topics could work.

I put the main hurricane point into Traceability. A lot could go under Overconfidence. Even sea level rise could go under Emphasis on Extreme Scenarios. Much of the topics John and Ross have been looking at could go under Timeline or Misleading Metrics

If we are able to do it under endemic topics, I think it will be more effective, with clearer take home messages (not just that we don't like what they did with temperature, etc). And it will be less work for us if we just need a few whopper examples for each topic

So here are some endemic topics

Inadequate Traceable Accounts

Overconfidence in Conclusions

Emphasis on Extreme Scenarios

Misleading Metrics

(Short Timelines) not sure what to call that

Confusing Climate and Weather

Something about advocacy words

ETC

Your thoughts on this?

p.s. I'm working on overconfidence and extreme scenarios

On Sat, Jun 7, 2025 at 4:18 PM John Christy <climateman60@gmail.com> wrote:

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<NCA5 report Jun7[SEK][JC].docx>

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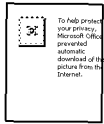
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From: John Christy <climateman60@gmail.com>
Sent: Sunday, June 8, 2025 2:00 PM
To: Steve Koonin
Cc: Judith Curry; Ross McKittrick; Roy W. Spencer; Travis Fisher; Josh Loucks; seth.cohen@hq.doe.gov
Subject: Re: June 7 NCA5 meeting follow up

Steve

The example of Pielke Jr, an internationally recognized expert on the topic for which his is brushed aside, points out what I've seen since being a key contributor on the 1992 IPCC report through being a Lead Author in 2001 and the many other climate panels with which I've had experience. It's a people problem. There is a sort of syndrome that develops in which authors who are selected for important projects somehow feel ordained with the "authority of the last word." I've found that those with least expertise have been most susceptible to this disease - and it points to a failure of skeptical peer review. At a minimum we can point out a couple of NCA5 examples but also demonstrate that we don't think of ourselves as the final word on climate science, that we welcome criticism and are willing to rewrite as needed. In truth, our ignorance of the climate system is enormous, and we are simply trying to get as far up as we can on the "what-we-actually-know" ladder that sits in a pool ignorance in which swim media-hype, career aspirations and political agendas. There are certainly more rungs above us to climb and we hope we can make a little progress in the upward direction.

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variability (e.g., the temperature discussion of Fig 1.1a compares 2002-2021 with the average of 1901-1960

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Sent: Sunday, June 8, 2025 10:58 AM

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Cc: Steve Koonin <steven.koonin@gmail.com>; Ross McKittrick <ross.mckittrick@gmail.com>; Roy W. Spencer <roywspencer@hotmail.com>; Travis Fisher <travis.scott.fisher@gmail.com>; Josh Loucks <loucksj14@gmail.com>; seth.cohen@hq.doe.gov

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From: Steven Koonin [steven.koonin@gmail.com]
Sent: 6/8/2025 4:21:24 PM
To: 'Judith Curry' [curry.judith@gmail.com]; 'John Christy' [climatemanager60@gmail.com]
CC: 'Ross McKittrick' [ross.mckittrick@gmail.com]; 'Roy W. Spencer' [roywspencer@hotmail.com]; 'Travis Fisher' [travis.scott.fisher@gmail.com]; 'Josh Loucks' [loucksj14@gmail.com]; seth.cohen@hq.doe.gov
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seth.cohen@hq.doe.gov
Subject: RE: June 7 NCA5 meeting follow up

Yes, this is good and I've merged it with the working draft.

But I wonder how (if any) proof points we should include. If none at all, it feels like it is just our assertions vs NCA5s, with no way for the reader to judge.

The spectrum of support we could offer ranges from none at all to referencing the CWG report to referencing the literature to including a bit of text and a graph. And that for each assertion.

Thoughts?

SEK

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7 June 2025, 2312 GMT

NCA5 Key Message 2.2 *Extreme Events Are Becoming More Frequent and Severe*

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Our analysis indicates that most of what is said above regarding increases in extreme events is highly misleading and when extended spatially to the full CONUS and temporally to the late 19th century we find little in the way of significant changes (see CWG25 Ch6 for details). Specifically:

Observations from 1899 show that daytime heat extremes in the CONUS are no more common now than 100 years ago. However, nighttime temperatures have risen noticeably, related mostly to infrastructure growth around weather stations, so there are now fewer cold winter extremes than 100 years ago. As such, temperature extremes are becoming less frequent with the difference between hottest and coldest days each year shrinking by 5°F since 1899. While the West has experienced a recent increase in heat extremes, most of the CONUS has experience long-term declines. There are regionally-heterogenous changes in average and extreme precipitation. Positive trends in annual average rainfall and extreme events (defined either as the annual maximum or the number of exceedances of the 99th percentile value) are generally weak or non-existent when looking at samples exceeding 130 years in length. Significant trends can be found when beginning the sample in the 1950s although in most cases the trends weaken and become insignificant when looking at the post-1980 interval. [For hurricanes see XXX]. The incidence of CONUS wildfires is primarily a result of fire-suppression practices and were much more frequent 100 years ago and especially prior to the 19th century.

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On Sat, Jun 7, 2025 at 3:27 PM John Christy <climateman60@gmail.com> wrote:

All

How will we handle Key Message 2.2? This covers much of what we've analyzed. We've got heat waves, downpours, hurricanes and wildfires (Oh My!) here. This thing is a real target-rich environment.

[Key Message 2.2] Extreme Events Are Becoming More Frequent and Severe

Observations show an increase in the severity, extent, and/or frequency of multiple types of extreme events. Heatwaves have become more common and severe in the West since the 1980s (high confidence). Drought risk has been increasing in the Southwest over the past century (very high confidence), while at the same time rainfall has become more extreme in recent decades, especially east of the Rockies (very high confidence). Hurricanes have been intensifying more rapidly since the 1980s (high confidence) and causing heavier rainfall and higher storm surges (high confidence). More frequent and larger wildfires have been burning in the West in the past few decades due to a combination of climate factors, societal changes, and policies (very high confidence).

I like the last sentence that says to me, "Wildfires are increasing in the West due to increases in everything that makes wildfires increase."

Also, as evidence of wandering outside of the congressional guardrails how about all those sections on "Climate Action"

John C.

John Christy
Director, Earth System Science Center
Professor, Atmos and Earth Science
Alabama State Climatologist
The University of Alabama in Huntsville
climateman60@gmail.com

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Steve Koonin

<NCA5 report Jun7[SEK][JC].docx>

--



Judith Curry, President
CFAN - Climate Forecast Applications Network
Reno, NV USA
curry.judith@cfanclimate.com | +1.404.803.2012
<http://www.cfanclimate.net>

From: Judith Curry <curry.judith@gmail.com>
Sent: Saturday, June 7, 2025 6:44 PM
To: John Christy
Cc: Steve Koonin; Ross McKittrick; Roy W. Spencer; Travis Fisher; Josh Loucks; seth.cohen@hq.doe.gov
Subject: Re: June 7 NCA5 meeting follow up

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Sent: 6/7/2025 8:38:40 PM
To: 'John Christy' [climateman60@gmail.com]; 'Ross McKittrick' [ross.mckittrick@gmail.com]; 'Judith Curry' [curry.judith@gmail.com]; 'Roy W. Spencer' [roywspencer@hotmail.com]; 'Travis Fisher' [travis.scott.fisher@gmail.com]; 'Josh Loucks' [loucksj14@gmail.com]; seth.cohen@hq.doe.gov
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Review of the Fifth National Climate Assessment

Exec Summary

The fifth National Climate Assessment (NCA5) by the U.S. Global Change Research Program (USGCRP) fails to meet the statutory requirements of the Global Change Research Act of 1990 (GCRA)¹ and violates Executive Order 14303, “Restoring Gold Standard Science” (EO14303).²

Under the GCRA’s terms, the USGCRP must issue periodic assessments to update policymakers on a variety of global changes. To fulfill its statutory mission to “describe and understand” the Earth’s systems and human impacts on them, such a report should be objective. However, USGCRP assessments have increasingly served to justify predetermined policy and societal actions.

Politicization of climate science is endemic owing to the international imperative of NetZero. Even in this context, the NCA5 is far more biased than the IPCC AR6 WG1 Report. Evidence of bias in the NCA5 includes:

Biased attribution. The NCA5 implicitly assumes that all warming is caused by anthropogenic emissions. Further, they attribute many impact drivers and extreme weather events to anthropogenic emissions, well beyond the IPCC AR6 WG1 assessment

Cherry picking of US weather and climate data. In most analyses, the NCA5 neglected to include data prior to 1950 (and in some cases prior to 1970), eliminating from consideration the 1930s – a decade with the worst heat waves and droughts and even the worst US landfalling hurricane.

Assumption that warming is dangerous. The NCA5 neglects benefits from more CO₂ in the atmosphere and from warming.

Implausible extreme emissions scenarios. It is now well known that the extreme emissions scenarios are implausible – UN climate negotiators (COP) have dropped the extreme emissions

¹ <https://www.globalchange.gov/about-us/legal-mandate>

² <https://www.federalregister.gov/documents/2025/05/29/2025-09802/restoring-gold-standard-science>

scenarios from their analyses and projections since 2021. Nevertheless, a word search of the NCA5 shows that a majority of the mentions were of the extreme emissions scenario

Uncritical acceptance of climate model outputs. The NCA5 uncritically accepts climate model outputs for regional climate impact assessments and 21st century projections. This uncritical acceptance is not justified in the Report, and is at odds with IPCC AR6 WG1 Report (Chapter 10)

Overconfidence of conclusions. The terminology NCA5 uses for confidence levels is inflated, leading to overconfidence in the conclusions.

Failure to adequately assess uncertainties. The NCA5 briefly mentions uncertainties for each major conclusion in a Traceability Account at the end of each chapter. These uncertainties do not appear to influence the conclusions or the confidence levels. The main text neglects obvious representations of uncertainty such as the statistical significance of trends

Emphasis on a single solution. The document advocates extensively for replacement of fossil fuels with wind and solar power.

The magnitude of the bias and lack of objectivity in the NCA5 Report is evidenced by comparing it with our CWG report. This document was authored by five scientists whose research and perspectives challenge the prevailing narrative – a category of author that was not included by the NCA5. The DOE included topics and data that were not included in the NCA5, and drew substantially different conclusions from the NCA5, particularly in context of a more comprehensive uncertainty analysis.

Introduction

This report responds to a request from OSTP Director Michael Kratsios (reproduced in Appendix XX) that we assess the suitability of the Fifth National Climate Assessment for informing climate and energy policies.

To conduct this assessment, we reviewed NCA5 itself, as well as the NASEM review of the Third Order Draft and the USGCRP responses to it. Our assessment is also informed by our experience in reading, writing, and leading advisory reports.

We find that NCA5 should not be relied on for policy making as it is an incomplete and misleading picture of our understanding of the changing climate and the risks it poses to the nation. NCA5 is most obviously incomplete because there have been significant developments in climate science since its literature cutoff date of 202?. We have reviewed those developments in a separate report for Energy Secretary Wright. Further, NCA5 misleads in its portrayal of climate science by omitting key elements of data or understanding even as of 2023. The overall effect of those omissions is an excessively dire picture of climate risk.

Our report begins with background on the National Climate Assessments. We then discuss the standards by which we have assessed NCA5, followed by specific deficiencies that we have identified.

About the National Climate Assessments

The U.S. Global Change Research Program (USGCRP) was established by Presidential Initiative in 1989 and mandated by Congress in the Global Change Research Act (GCRA) of 1990 to develop and coordinate “a comprehensive and integrated United States research program which will assist the Nation and the world to understand, assess, predict, and respond to human-induced and natural processes of global change.”

The National Climate Assessment (NCA) Reports evolved from the GCRA requirement to

Prepare and submit to the President and the Congress an assessment which (1) integrates, evaluates, and interprets the findings of the Program and discusses the scientific uncertainties associated with such findings; (2) analyzes the effects of global change on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biological diversity; and (3) analyzes current trends in global change, both human-induced and natural, and projects major trends for the subsequent 25 to 100 years.

The five NCA Reports to date have interpreted this mandate in different ways:

- NCA1 (2000) was a multidisciplinary effort to study and portray in regional detail the potential effects of human-induced global warming on the United States.
- NCA2 (2009) was a relatively short report that not only focused on the potential consequences of climate change, but also sought to identify potential adaptation measures and identify the highest priorities for future research.
- NCA3 (2014) was an expanded effort that continued along the lines of NCA2, and was distinguished by a comprehensive review process, including a review by the National Academy of Sciences.
- NCA4 (2017/2018) was an expanded effort published in two volumes: I Climate Science Special Report, and II Impacts, Risk, and Adaptation in the United States. This was the first NCA report to devote significant effort to assessing climate science. NCA4 introduced a traceability analysis for each key finding, including a cursory description of uncertainties.
- NCA5 (2023) returned to a single volume format, reducing discussion of climate science to a cursory two chapters, with continuing with a focus on regional and sectoral impacts of climate change. NCA5 expanded its remit to topics that are arguably outside the purview of the USGCRP, focusing on “Climate Action” and policy recommendations with a social justice emphasis. NCA5’s self-description is reproduced as Appendix II.

These successive interpretations of the NCA are poorly aligned with the GCRA’s statutory requirements. Only NCA4 gives serious consideration to climate science, which receives the great majority of USGCRP funding, and even then misrepresents some important points (see the Box nearby for an example). Natural climate variability is essentially dismissed as unimportant in NCA4 and barely mentioned in NCA5 in most contexts, despite the mandate to include both human-caused and natural climate change. Most significantly, NCA5 has redirected the focus away from climate science and even the hazard elements of impacts, towards evaluation of societal vulnerabilities and advocacy for particular policy options, especially wind and solar power. The cover image for the NCA5 Report is the installation of a solar panel.

START BOX

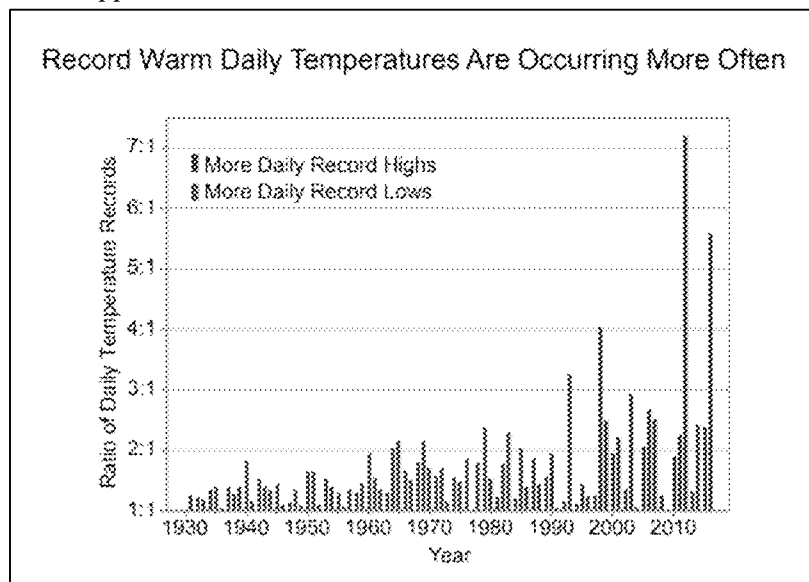
NCA4’s Figure ES.5: A Tale of Deception and Review Failure

A disappointing example of NCA4’s misrepresentation of climate science involves U.S. temperature extremes. Here is a summary of the issue; details can be found in Koonin (2024).

NCA4's Part I (Climate Science Special Report, CSSR) says (prominently and with *Very High Confidence*) on Page 19 of the Executive Summary:

There have been marked changes in temperature extremes across the contiguous United States. The number of high temperature records set in the past two decades far exceeds the number of low temperature records.

and offers this figure in support:

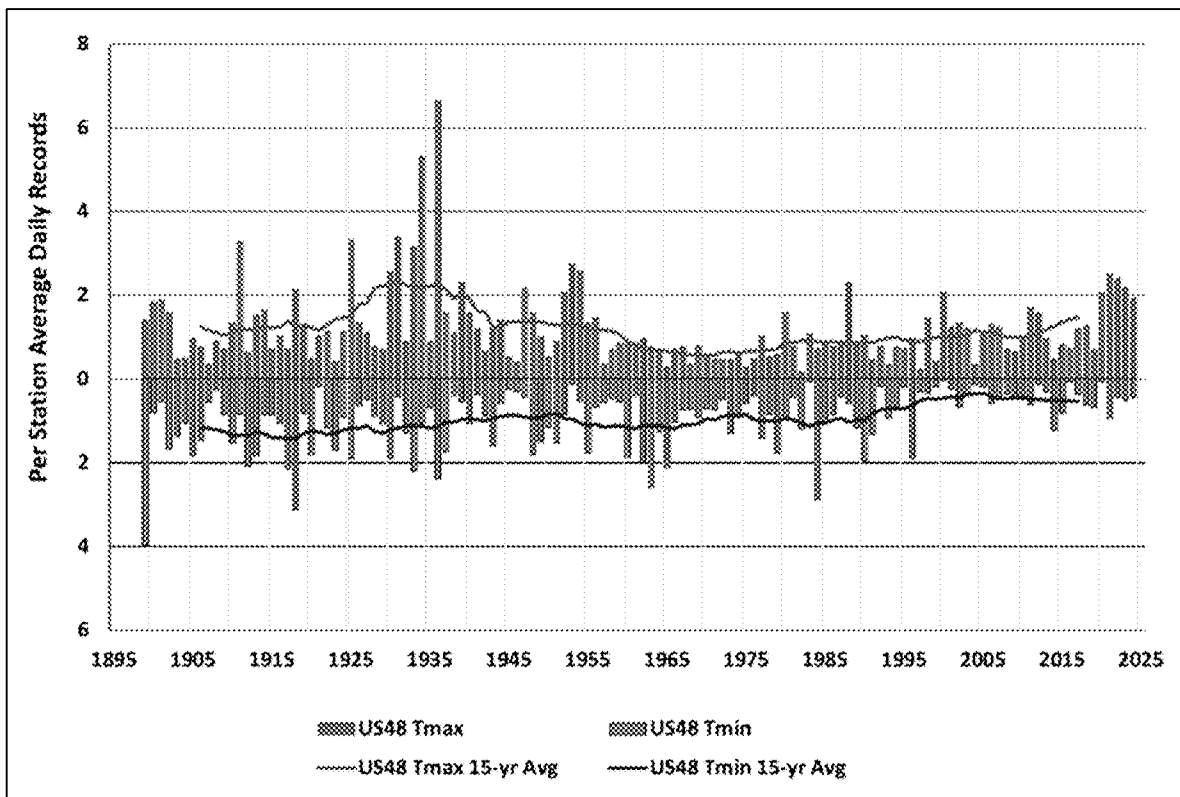


CSSR Figure ES.5 The ratio of the number of daily record high temperatures to daily record low temperatures for many stations across the 48 contiguous states is shown for each year from 1930 to 2017. The lighter bars show a year in which there were more record highs than lows, while the darker bars show years in which there were more record lows than highs. The height of the bar indicates the ratio of record highs to record lows for each year. For example, a ratio of 2:1 for a dark bar means that the stations had twice as many record daily lows as record daily highs for that year. (CSSR, 2017)

Three idiosyncratic choices combine to generate the figure's seemingly alarming rise in recent decades. First, because the record extremes tallied are defined conventionally (i.e., each more extreme than any preceding value in the history), the numbers of record highs and record lows are both expected to decline through the years (it becomes increasingly unlikely that a record will be exceeded). Second, the graph displays not the numbers of record highs and lows, but rather their ratio. And finally, the history begins only in 1930 when, in fact, data exist beginning in the late 19th Century. The upshot of these choices is that the resultant figure is guaranteed to show a long period of quiescence around followed by dramatic variations, creating the impression of large changes in recent decades.

Figure 6.3.3 of the CWG report (reproduced below) shows the results of a proper analysis – defining each record as the singular extreme in the history, displaying numbers of warm and cold records separately, and beginning the analysis in 1899 rather than 1930. It makes evident the exceptional heat of the 1920s and especially the 1930s, peaking in 1936. The increased heat of the past five years is too brief to be deemed climatically significant and, in any event, occurred after the CSSR was published in 2017. On the cold side,

the Valentine's Day Arctic outbreak in Feb 1899 stands as the most extensive cold extreme experienced by CONUS, with 1917 in 2nd place. The frequency of cold records has declined, especially over the last quarter of the period in which only 13 percent of the extreme cold events were measured. In contrast, 25 percent of the extreme Tmax records were achieved in the last quarter, in accordance with statistical expectations. As a result, the ratio shown in the CSSR explodes in recent decades. And the overall reduction in numbers of both cold and hot extremes over the past century indicates a climate *less* prone to extremes, in sharp contrast to the title of the CSSR figure, "Record Warm Daily Temperatures Are Occurring More Often".



Number of daily record High (red) and Low (blue) temperatures for warm and cold seasons in the CONUS. The lines represent the 15-year running, centered average. Source: 1,211 USHCN stations supplemented as needed to achieve a minimum of 92 percent of observations in the 126-year period since Dec 1898. US48: contiguous U.S. states. Tmax: maximum temperature. Tmin: minimum temperature.

The National Academies' expert review panel criticized the discussion of temperature extremes in a late draft of the CSSR. In reference to the CSSR's Key Finding 2 of Chapter 6, they said:

Further, it is difficult to understand how a statement that includes increases in extreme warmth can be associated with a high confidence or extremely likely statement, given that most of the graphics in this chapter show a decrease in extreme warmth in the historical record.

The Federal official in charge of the CSSR (Michael Kuperberg, Executive Director of the USGCRP) responded to the Academies' review by noting that

Almost every recommendation from the NAS was incorporated [in the final version]... and a new figure was added on changes in record high and low temperatures

The “new figure” referred to is the Figure ES.5, which did not appear in the draft reviewed by the Academies’ panel. It seems unlikely that the Academies panel ever saw that figure because they surely would have commented if they had and it wouldn’t have survived to publication. And the figure’s problems were evidently not flagged (or were ignored) in the subsequent internal government reviews.

While the following statement has far less headline potential than that from the CSSR’s page 19 quoted at the beginning of this box, it has advantage of being correct:

There have been some changes in temperature extremes across the contiguous United States. The annual number of high temperature records set shows no significant trend over the past century nor over the past 40 years, but the annual number of record cold nights has declined by a factor of 4 since 1895, somewhat more rapidly in the past 30 years.

END BOX

Standards for Assessing NCA5

Good climate and energy policies will balance the risks and benefits of a changing climate against the world’s growing demand for reliable and affordable energy. To strike that balance, policymakers must understand at least two complex and nuanced topics –the certainties and uncertainties of climate science and the technoeconomic realities of energy systems. Experts in those subjects can bring the facts to the discussion and so have a unique responsibility to communicate their understanding to non-experts clearly, completely, and without bias.

Expertise in energy systems resides largely in the private sector, where it is essential to providing the reliable and affordable energy services that are the lifeblood of society. Understanding is therefore continually refined and tested by the discipline of the marketplace. In contrast, climate science expertise is found largely in the non-profit realm of universities and government laboratories and so has a more academic character.

Because climate is at the core of human existence, it can engender passion and emotion. Indeed, some younger climate scientists have gone into the field to “save the planet.” So it isn’t surprising that objectivity can suffer when climate scientists communicate their understanding to non-experts. Further, the field of climate science has been politicized by NetZero mandates. This lack of objectivity usurps the public’s right to make informed choices and undermines their confidence in the scientific enterprise.

Philip Handler, President of the National Academy of Sciences, identified the problem in a 1980 editorial that resonates eerily four decades later:

Difficulty arises in the scientific community from confusion of the role of scientist *qua* scientist with that of scientist as citizen, confusion of the ethical code of the scientist with the obligation of the citizen, blurring the distinction between intrinsically scientific and intrinsically political questions. When scientists fail to recognize these boundaries, their own ideological beliefs, usually unspoken, easily becloud seemingly scientific debate.

Good scientific input to policymaking starts with good science. President Trump’s executive order of May 23, 2025, “Restoring Gold Standard Science” enumerates some of the characteristics of good science:

- i. reproducible;
- ii. transparent;
- iii. communicative of error and uncertainty;
- iv. collaborative and interdisciplinary;
- v. skeptical of its findings and assumptions;
- vi. structured for falsifiability of hypotheses;
- vii. subject to unbiased peer review;
- viii. accepting of negative results as positive outcomes; and
- ix. without conflicts of interest.

Although these should be self-evident to those trained in science, it is surprising that some have found them controversial.

But advice on climate risk has other desiderata, including statements about the strength of climate knowledge. The IPCC’s approach is based on judgment of the available evidence and agreement among experts. More sophisticated knowledge characterizations for risk management include (Aven, 2017):

- The degree to which the assumptions made are reasonable/realistic based on background knowledge—concern about the focus on implausible emissions scenarios RCP8.5/SSP5–8.5
- The degree to which data/information exists and are reliable and relevant—the historical and paleo database is inadequate for a complete characterization of natural climate variability on multi-decadal to millennial time scales
- The degree to which there is disagreement among experts (including those from different environments or academic fields)—attempts to suppress disagreement and alternative perspectives among experts
- The degree to which the phenomena involved are understood and accurate models exist— concerns about the fidelity and utility of climate models
- The degree to which the knowledge has been thoroughly examined with respect to unknown knowns and—neglect of the unknown knowns associated with natural climate variability

Deficiencies in NCA5

We summarize here some salient deficiencies we’ve identified in NCA5. Some of them are endemic, while others are specific to key points that NCA5 makes. In identifying these deficiencies, we have examined NCA5 itself, the NASEM review of the Third Order Draft and the USGCRP response to that review, as well as prior NCA reports. We have also drawn upon our decades of experience in the science and writing advisory reports, as well as the recent assessment of climate science we prepared for the DOE.

We have focused on NCA5’s Chapters 1-3 and selected additional sections. These chapters cover the foundational climate science that supports the validity of the later chapters.

[few-line descriptions of the individual problems go here. We’ll have to see how to parse or group and order them.]

- Misrepresentation of changes in extreme precipitation
- Misrepresentation of heat extremes
- Misrepresentation of snowfall [
- Pervasive advocacy language and promotional tone
- Overstating what underlying sources show
- Uncritical definition of scientific “advances”
- Sweeping generalizations regarding complex matters
- Hurricanes
- Projections of Sea Level Rise
- RCP8.5
- Ambiguous use of “climate change”
- Misrepresentation of historical data and it’s analysis, as well as projections
- Misrepresentation of the potential of wind and solar
- ...

Summary Assessment of NCA5

As such, the NCA Reports, and particularly the NCA5, are in many ways non-compliant with the GCRA mandate:

- Failure to adequately assess climate science (with the exception of NCA4)
- Failure to adequately consider natural climate variability in detection and attribution analyses and in projections
- Failure to adequately assess uncertainties.

Further, the confidence levels in the NCA reports are vastly inflated, based on terminology alone. NCA5 conclusions with medium confidence are justified by “Suggestive evidence (a few sources, limited consistency, models incomplete, methods emerging, etc.) competing schools of thought. NCA conclusions with high confidence are justified by “Moderate evidence (several sources, some consistency, methods vary and/or documentation limited, etc.), medium consensus.

In summary, the NCA reports have arguably been off the mark since the inception of the program. There are many topics that the NCA should have considered but didn’t, and the NCA5 in particular has considered topics outside the remit of the USGCRP. The neglect of critical topics and credible uncertainty analyses has led to bias in the reports.

As such, the NCA reports are not an objective source of information to inform U.S. policy.

Appendix I: Letter requesting this report

To come from Travis et al.

Appendix II: NCA5 in its own words

About NCA5 [from its pg xx]

The Global Change Research Act of 1990¹ mandates that the US Global Change Research Program (USGCRP) deliver a report to Congress and the President not less frequently than every four years that "integrates, evaluates, and interprets the findings of the Program and discusses the scientific uncertainties associated with such findings; analyzes the effects of global change on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biological diversity; and analyzes current trends in global change, both human-induced and natural, and projects major trends for the subsequent 25 to 100 years."

The Fifth National Climate Assessment (NCAS) fulfills that mandate by delivery of this Assessment and provides the scientific foundation to support informed decision-making across the United States. By design, much of the development of NCAS built upon the approaches and processes used to create the Fourth National Climate Assessment (NCA4),² with a goal of continuously advancing an inclusive, diverse, and sustained process for assessing and communicating scientific knowledge on the impacts, risks, and vulnerabilities associated with a changing global climate (App. 1).

The findings in this report are based on a comprehensive review and assessment of information sources determined to meet the standards and documentation required under the Information Quality Act and the Foundations for Evidence-Based Policymaking Act of 2018 (App. 2), including peer-reviewed literature, other literature, Indigenous Knowledge, other expert and local knowledge, and climate data processed and prepared for authors by NOAA's Technical Support Unit (TSU; see Guide to the Report section below and App. 3).

NCAS was thoroughly reviewed by Federal Government experts, external experts, and the public multiple times throughout the report development process. An expert external review was performed by an ad hoc committee of the National Academies of Sciences, Engineering, and Medicine.³ Additional information on the development of this Assessment can be found in Appendix 1: Assessment Development Process.

NCA5 Intended Audience and Scope of Chapters [from its p xxi]

Intended Audience

The products of the US Global Change Research Program are designed to assist the Nation and the world in understanding, assessing, predicting, and responding to human-induced and natural processes of global change. National Climate Assessments synthesize scientific information and evaluate the state of the science on climate change to inform a broad audience of decision-makers across the country. These decision-makers include national, state, local, and Tribal governments, city planners, public health officials, adaptation specialists, nurses, farmers, business owners, community organizers, researchers, water utilities, ecosystem managers, educators, students, the media, and concerned individuals who need to make timely decisions about the climate impacts they are facing. National Climate Assessments make policy-neutral and policy-relevant information accessible and actionable by relying on the expert judgment of the report authors to determine what topics are included in each chapter, to describe what we know and where uncertainties remain, and to clearly communicate the risks, responses, and opportunities associated with climate change.

Overview

The Overview chapter presents the major findings of the report alongside highlights drawn from across NCAS. This chapter provides a synthesis of material from the underlying report chapters.

Physical Science Chapters

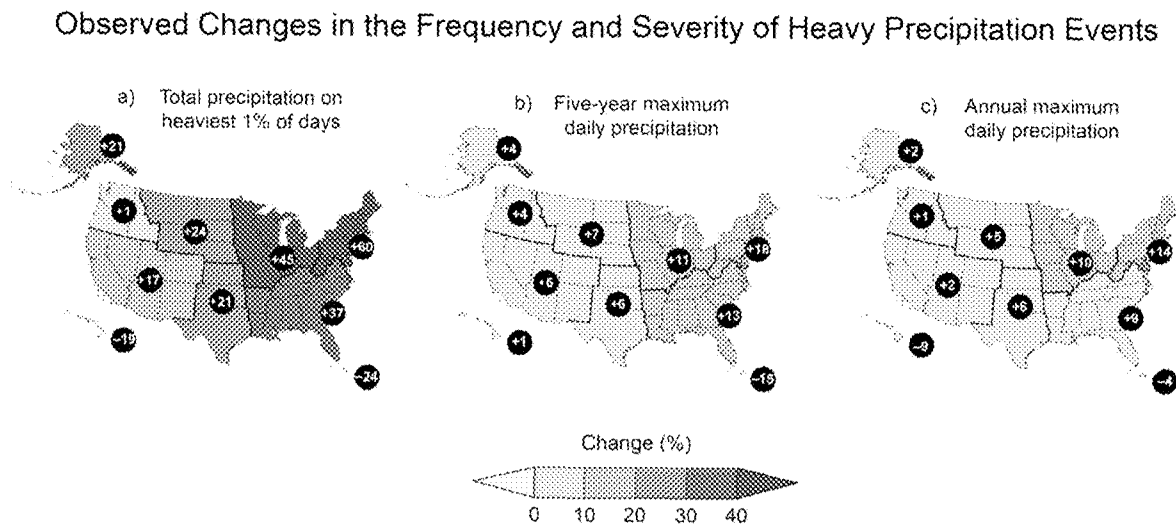
The Climate Trends and Earth Systems Processes chapters (Chs. 2, 3) assess how climate change affects physical Earth systems, with a focus on the United States, including observations and projections of climate

change and discussion of how methods to understand changes in Earth systems have advanced since NCA4, which was released in November 2018.

Appendices III: Details of NCA5's deficiencies

Misrepresentation of changes in extreme precipitation [Christy]

Below is Fig. 2.8 from NCA5 indicating heavy, short-duration precipitation events are becoming more frequent and severe, mainly in the Eastern US.



Heavy precipitation events are becoming more frequent and intense across much of the country.

FIGURE 2.8. The frequency and intensity of heavy precipitation events have increased across much of the United States, particularly the eastern part of the continental US, with implications for flood risk and infrastructure planning. Maps show observed changes in three measures of extreme precipitation: (a) total precipitation falling on the heaviest 1% of days, (b) daily maximum precipitation in a 5-year period, and (c) the annual heaviest daily precipitation amount over 1958–2021. Numbers in black circles depict percent changes at the regional level. Data were not available for the US-Affiliated Pacific Islands and the US Virgin Islands. Figure credits: (a) adapted from Easterling et al. 2017;¹²⁶ (b, c) NOAA NCEI and CIRES NC.

The NCA5 concludes from this evidence and citing two papers from model studies,

There is robust evidence that human-caused warming has contributed to increases in the frequency and severity of the heaviest precipitation events across nearly 70% of the US.^{126,127}

A scientific examination of this claim would have considered the following questions among many,

- (1) Why do the analyses begin with 1958 when measurements are available from the late 19th century?
- (2) Given that hydrologic/precipitation events are subject to “Long-Term Persistence” (LTP) where long dry- and wet-spells are common features, is it likely such changes are examples of natural variability for any 64-year period? Are these percentage changes significant?
- (3) Were the climate model simulations subjected to independent evaluation before concluding that they represent not only basic climate variations, but precipitation processes accurately enough to allow someone to conclude that human emissions contributed to the changes?

The Diffenbaugh et al. 2018 citation [126] used a short observational window of 1961-2005 to determine “historical” trends, then analyzed output from the implausible RCP8.5 climate model simulations to claim changes were likely human-caused. [See “BOX: Perils of short data records” Ch6 DoE-CWG 2025].

The Kirchmeier-Young 2020 citation [127] utilized observations for only 1961-2010. The model output again was taken from the implausible RCP8.5 simulations. The model output then had to be multiplied by “scaling factors” to force agreement with the magnitudes of historical observations of extreme events. Furthermore, the focus of the analysis was on the CanESM2 CMIP-6 model, one that produced global atmospheric temperature trends that were a factor of 2.5 too positive compared with observations due to excessive sensitivity to GHG forcing (+0.43 vs. +0.17 °C/decade, 1979-2024).

We note the following deficiencies behind NCA5’s claim (see DoE-CWG Ch4-6 for details on these issues),

- (1) “Historical” results for change-analysis are based on short data periods.
- (2) The emissions scenario employed was the implausible rcp8.5.
- (3) Results are based on overly-sensitive models (ECS up to 5.6 °C).

To understand the character of recent changes against the background of a better-quantified natural variability we constructed continuous daily precipitation datasets for stations within four regions; (1) Pacific Coast (1893ff) where IPCC AR6 suggested an increase in Atmospheric River events had been observed since 1948, and three regions that NCA5 indicates are experiencing increases in short-duration

heavy events; (2) Upper Midwest (1893ff), (3) Humid Southeast (1872ff) and (4) Northeast (1888ff). Surprisingly, NCA5 did not perform significance-testing on the alleged changes.

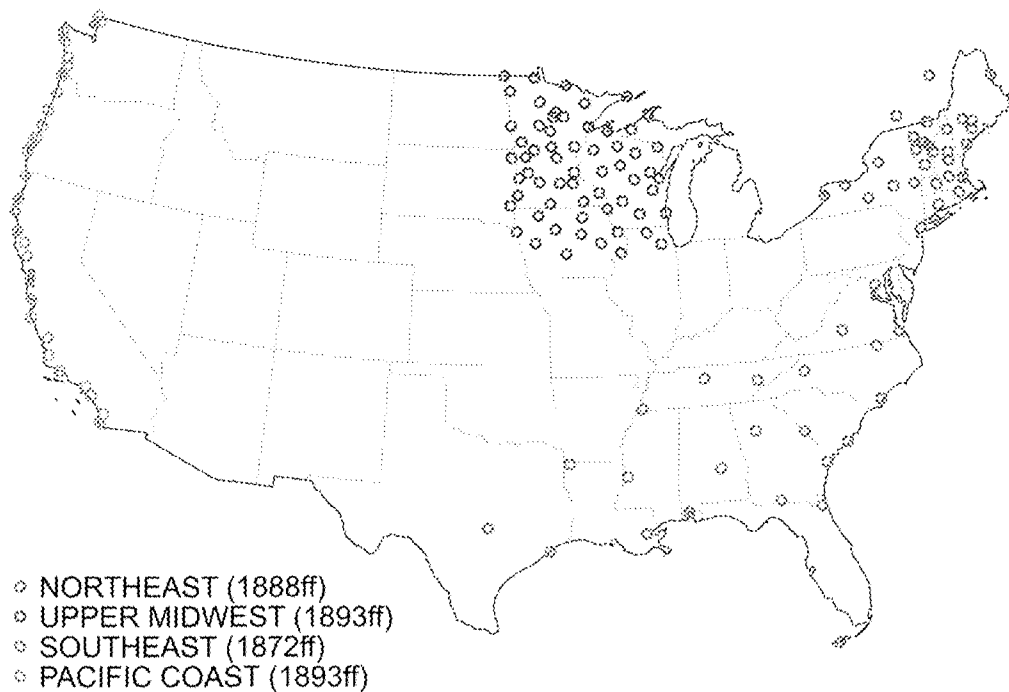


Figure. Location of stations utilized in this study.

Following McKittrick and Christy 2019 (who found no significant changes in the West and Southeast with observations beginning in the late 19th century) we apply the more appropriate statistical analysis which characterizes LTP for precipitation events to determine if these changes are significant. [The critical importance of incorporating LTP is described in Ch6 of the DoE-CWG 2025.]

When using time series > 130 years the results indicate that while some individual stations have significant positive trends in extreme-event totals and occurrences, regional values do not. Thus, attributing a non-significant change in a phenomenon (increased number of heavy precipitation events) to a specific cause (increased concentrations of GHGs as depicted in poor models with implausible inputs) does not support the NCA5 claim that there is “robust evidence” that human emissions are contributing to changes observed. We conclude that the NCA5 methods and conclusions do not meet the very basic standards of scientific analysis.

Diffenbaugh, N.S., D. Singh, and J.S. Mankin, 2018: Unprecedented climate events: Historical changes, aspirational targets, and national commitments. *Science Advances*, **4** (2), 3354. <https://doi.org/10.1126/sciadv.aao3354>

Kirchmeier-Young, M.C. and X. Zhang, 2020: Human influence has intensified extreme precipitation in North America. *Proceedings of the National Academy of Sciences of the United States of America*, **117** (24), 13308–13313. <https://doi.org/10.1073/pnas.1921628117>

Misrepresentation of heat extremes [Christy]

There are mixed (and somewhat convoluted) messages in NCA5 regarding the notion that hot extremes are increasing in the CONUS. In summary-claims, using alarming language, i.e., “record-shattering”, attention is drawn to examples in restricted regions in the CONUS or to short, recent time periods. However, the document does occasionally acknowledge the 1930s heatwaves and the overall decline of hot events in the past 100 years. From NCA5 chapter 2,

(Key Message 2.2) Observations show an increase in the severity, extent, and/or frequency of multiple types of extreme events. Heatwaves have become more common and severe in the West since the 1980s (*high confidence*).

The Risk of Temperature Extremes Is Changing

By some measures, the most extreme heatwaves on record in the United States occurred during the Dust Bowl era of the 1930s. ... Several major heatwaves have affected the US since 2018, including a record-shattering event in the Pacific Northwest in 2021. The western US has been particularly affected by extreme heat since the 1980s (Figure 2.7), experiencing a larger increase in days over 95°F, as would be expected given the greater warming in that region relative to the eastern US. By contrast, the number of very hot days has actually decreased across the central and eastern regions due to summer cooling trends in the region (Figure 2.7; Ch. 22). This does not, however, mean the central and eastern US are not affected by heat. The impacts of extreme high temperatures are more severe if such conditions persist for several days, and overall, multiday heatwaves have become hotter, more frequent, larger, and longer lasting in recent decades. Across 50 large US cities, the US Global Change Research Program heatwave indicator (<https://www.globalchange.gov/indicators/heat-waves>) shows that the average number of heatwaves has doubled since the 1980s, and the length of the heatwave season has increased from about 40 days to about 70 days.

Nighttime temperatures are rising faster than daytime temperatures, and the number of nights where the temperature never falls below 70°F is increasing everywhere in the US except the Northern Great Plains (Figure 2.7). The extent of CONUS experiencing hot summer nights is growing at a faster rate than the extent experiencing hot summer days.

The NCA5 focused much of the heat-discussion on the western CONUS, including the Pacific Northwest heatwave of 2021, as well as rising nighttime temperatures. It only briefly mentions the long-term decline in heat extremes in most of the CONUS. While factually correct in a narrow sense, the full revelation of non-alarming facts is not apparent. We also note the convoluted reasoning in the quote above that hot extremes are apparently due to “greater warming” in the region than experienced elsewhere and that declining hot extremes are “due to summer cooling trends”. Since “trends” do not cause changes, one might ask, “What caused the warming *and* cooling trends?”

These heat issues are addressed in Ch6 of the DoE-CWG demonstrating that the range and magnitude of extreme temperatures (10s of degrees) are driven more by the chaotic behavior of natural variability than the small extra forcing from the enhanced concentrations of CO₂. The DoE-CWG conclusion is that both in terms of hot days ($\geq 95^{\circ}\text{F}$) and number of days in heatwaves, the current decade is experiencing no more than was experienced 100 years ago. For example, in the 30-year period 1925-1954, representing only 23% of the 1899-2024 data record, the CONUS experienced 33% of the total heat wave days. The most recent 30-years experienced 24%, almost exactly that expected by chance. Thus the claim “multiday heatwaves have become hotter, more frequent, larger, and longer lasting in recent decades,” is simply false when beginning in 1899 (Ch6 Fig. 6.3.6 DoE-CWG).

Figure X displays the occurrence of days $\geq 95^{\circ}\text{F}$, showing the increase in the three western regions and declines elsewhere. Additionally, the trends in both heatwave days and hot days are (insignificantly) negative for the CONUS as a whole.

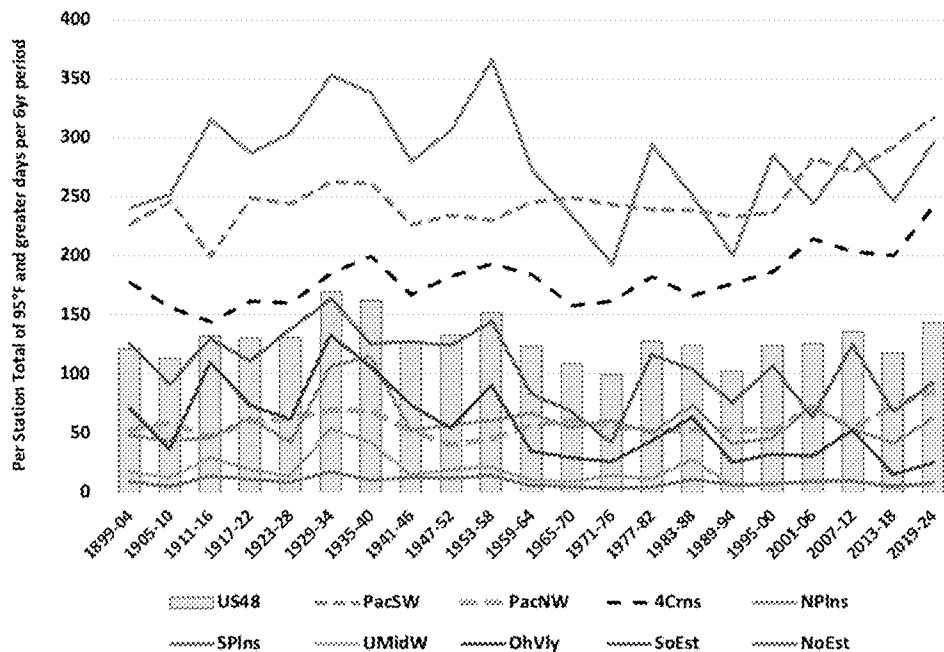


Figure. Number of days $\geq 95^{\circ}\text{F}$ in 6-year periods (1899-2024) for nine CONUS regions (lines, dashed positive trends, solid negative trends) and full CONUS (bars).

The fact (and we agree it is a fact) that summer nighttime temperatures have risen rapidly since 1960 nearly everywhere, and especially in the largest cities, is clear. However, this observation is more a consequence of the urban heat island effect (which has greatest impact on stations changing from rural to semi-rural, Ch6 DoE-CWG) and the choice of starting in the 1960's, the coolest decade since the 1910's.

In attributing claims of rising heat extremes to GHG concentrations, the NCA5 concentrated on the localized 2021 event but is silent on the attribution of declining heat extremes in the eastern 2/3 of the CONUS (the statement "due to summer cooling trends" does not suffice) or the major role that the increasing growth of infrastructure around the stations exerts on nighttime temperatures. The scientific method requires one to demonstrate that a claim must represent all of the evidence, not simply a small portion that agrees with the claim. In this instance the NCA5 falls short of rigorously demonstrating that rising GHG concentrations are responsible for the observed changes (or lack thereof) in hot extremes in the CONUS.

Misrepresentation of snowfall [Christy]

The introduction to NCA5 Chapter 4 “Water” is unequivocal and rather ominous.

Climate change is intensifying rainfall and floods, deepening droughts, and shifting weather patterns across the globe, causing profound effects on terrestrial freshwater supplies and quality. Rising sea levels, reduced snowpacks, shrinking rivers, and declining groundwater threaten cities and rural communities and endanger forest, riverine, and other ecosystems across the United States.

The CWG25 report provides evidence that several of these alarming claims are misleading or untrue. Here we examine “Box 4.1 Washington-California 2015 Snow Drought” in which a single season was examined for its record or near-record low snow totals to draw attention to a drying climate in the West. While the Introduction shouts about “*deepening droughts and shifting weather patterns*” in the later text under “Drought Impacts” the NCA5 acknowledges that “*Megadroughts are events of extraordinary duration and severity, and many are documented in paleoclimate records.*” However, this is then followed by more somber statements,

Temperature’s contribution to drought makes it clear that warming associated with climate change could increase the frequency, severity, and/or duration of drought and drive aridification, a long-term shift toward a drier climate, which is a concern in already dry parts of the West.

and

In areas of the West where snow is the dominant source of runoff, total seasonal snow water volume is projected to decrease by more than 24% by 2050 under intermediate (RCP4.5) and higher scenarios, with persistent low-snow conditions emerging within the next 60 years.

Thus, on the one hand, major shifts in historical precipitation (and thus snowfall) patterns in the West are well documented in which “megadroughts” - more significant than any dry spell of the past 130 years - are a normal part of the western climate system. On the other hand, the NCA5 informs us that we should be concerned about these patterns as they “shift toward a drier climate”.

“Snowfall” is the total of the amount of snow that falls each day accumulated over a season. This is not the more familiar “snowpack on 1 April” which is simply the depth of snow on a single day which represents the snow that has accumulated through the winter but not yet melted. This latter metric is operationally useful for hydrologic projections of spring and summer runoff in the far-western mountains (Cascades in Washington and Oregon and Sierra Nevada in California).

[Snowfall is actually a directly-measured metric as opposed to “water equivalent”, the amount of liquid the snow would produce if melted. Before 1960, water equivalent was often not measured at all but simply (and easily) calculated as the new snowfall divided by 10 (examples in Christy 2012).]

Has western snowfall changed as a result of “a long-term shift toward a drier climate”? As noted above, NCA5 cites a modeling study that projects a 24% decline in snowfall by 2050, though total precipitation projections are mixed, being positive for the Cascades and negative for the Sierra Nevada (NCA5 Fig. 4.3).

Christy 2022 examined the snowfall question for the western mountain ranges of the Cascades and Sierra Nevada. Updated information through the 2024-25 season is presented below. Trends since the late 19th century and since 1975 (last 51 years) are insignificant due in part to the high interannual variability, thus an attributable decline has not been detected. The evidence provided here does not suggest a long-term shift toward decreasing snowfall in the mountains of the Pacific West (see also CWG25 6.4).

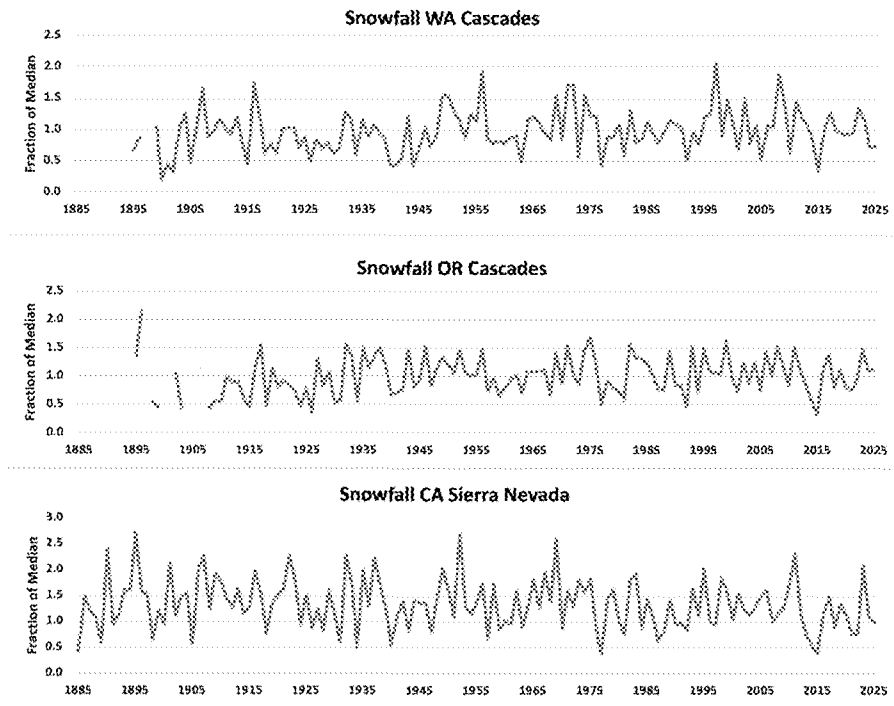


Figure. Nov-Apr snowfall as a fraction of the seasonal median total for the Cascades of Washington (top) and Oregon (center) and the Sierra Nevada of California (bottom).

Christy, J.R., 2012: Searching for information in 133 years of California snowfall observations. *J. Hydrometeor.* 13, 895-912. DOI:10.1175/JHC-D-11-040.1.

Christy, J.R., 2022: Time series construction of Oregon and Washington snowfall since 1890 and an update of California snowfall through 2020. *J. Hydrometeor.* DOI:10.1175/JHM-D-21-0178.1.

Pervasive advocacy language and promotional tone [McKittrick]

Countless examples.

Ch1 - overview

- Page 1-6 policy advocacy that fails to discuss costs of actions
- “Each additional increment of warming leads to greater risks” but so does each additional increment of measures to reduce GHG emissions
- P. 1-9 uses irrelevant cost measure (“levelized”) that ignores quality differences in power sources
- 1-14 includes SSP5-8.5 in list of “plausible futures”

- 1-16 Changes are “unprecedented over thousands of years”: ignores persistent uncertainties in paleo reconstructions and the fact that measurement of pace of change thousands of years ago are very imprecise
- 1-16 refers to trends without reference to the time scale
- 1-17 all statements presented as definitive with no admission of uncertainty or contingency on data quality and estimation methods
- 1-18 uncritically uses Billion Dollar Disaster data set which has been withdrawn
- 1-19 Land Surface Temperature versus median household income within cities has nothing to do with climate. It is more likely that low-income households concentrate where housing is less expensive which tends to be in areas with less parkland and tree cover
- 1-26 projected losses due to flooding ignores current data showing decreasing floods on average <https://www.epa.gov/climate-indicators/climate-change-indicators-river-flooding>
- 1-42 makes very non-mainstream assertion about climate economics

Ch 2

Key message 2.1 “Climate Is Changing, and Scientists Understand Why”

- Overly confident language
- 2-4 US warming faster than planet as a whole. But this is trivial since the comparison includes oceans. All land surfaces warm faster than the ocean. So why raise this point?
- PNW heat wave used as an example of validity of extreme event attribution – we address this work in CWG25 report. NCA5 hedges a bit by only saying AGW raised the temperature a couple of degrees. But then:
 - Para 3: CC affecting people, Extreme heat resp for more than 700 deaths per year from 2004 to 2018. But doesn’t mention decline in cold weather-related mortality. Then invokes BDD without acknowledging limitations
 - Para 5: Climate change has other consequences... the PNW heat wave caused more than 1400 heat-related deaths (thus insinuating all deaths due to AGW rather than tiny fraction associated with final degree of warming)
- Western wildfires “made more severe by climate change” yet intensity trends don’t support this (CWG Fig 6.8.3) also global data don’t support this claim
- “As the Planet Warms, Storms Become More Dangerous”: but the ensuing discussion refers to model forecasts not observations, and does not provide any supporting historical information nor does it acknowledge the observed decline in tornado activity (CWG25 p. 67).

Reliance on Billion Dollar Disaster data in multiple places. Even if it hadn’t recently been officially withdrawn the authors should have assessed it skeptically and rejected it as unfit for the purpose of measuring climate trends.

p. 3-10 Narrowing range of ECS by 50%.

This section summarizes the issue with way too much confidence. NCA5 says the narrowing has been achieved “through unprecedented quantitative synthesis of evidence from observed changes over recent decades, the industrial era, and paleoclimate.” It was one study, and it

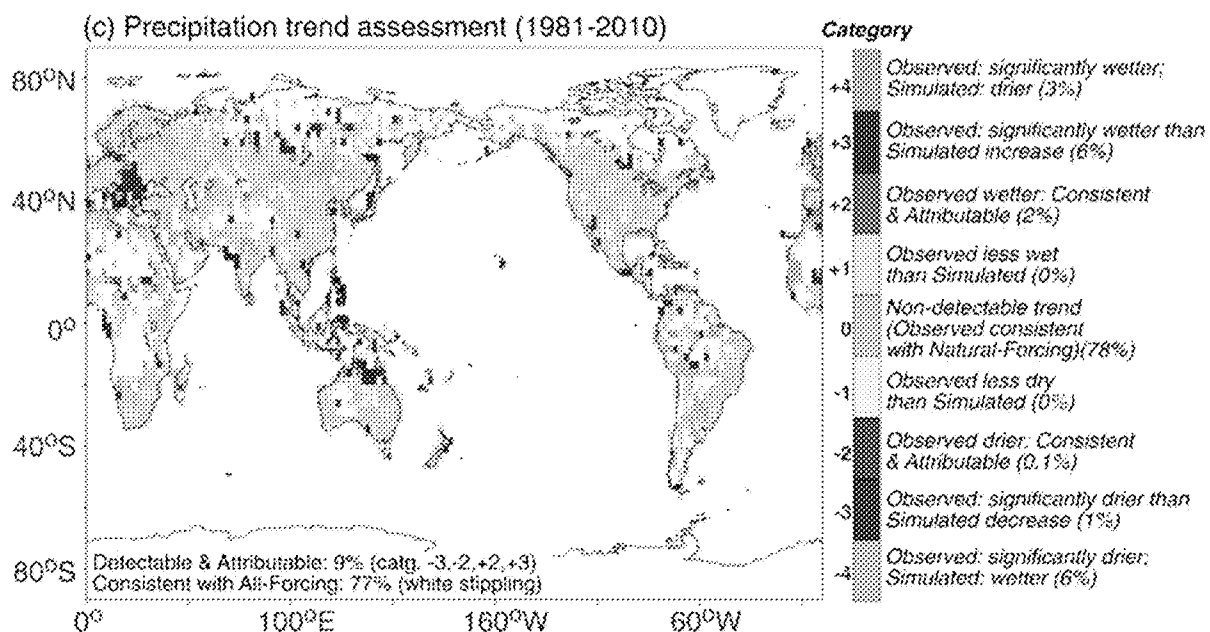
has already received substantial challenge in the literature (CWG 4.3) The NCA5 section provides no discussion of the simultaneous emergence of evidence (especially from the LT and MT) of low ECS.

Overstating what underlying sources show [McKittrick]

P. 2-11 increase in precipitation in central and eastern US based on comparison of 2002-2021 average to 1901-1960, which is a weird metric, the change is called a “trend” although that’s not how a trend is measured, and it is “attributable to climate change”. The claims were attributed to

- Knutson and Zeng (2018) “Model Assessment of Observed Precipitation Trends over Land Regions: Detectable Human Influences and Possible Low Bias in Model Trends” *Journal of Climate* 31(12) <https://journals.ametsoc.org/view/journals/clim/31/12/jcli-d-17-0672.1.xml>

But it did not say these things. It examines linear trends over 1901 – 2010, 1951 – 2010 and 1981 – 2010. It does not compare average rainfall over 2002 - 2021 to average rainfall over 1901 – 1960. With regard to the final period its results are:



Gray indicates no trends detected. Stippling means only that there were no trends in the models either so the models and obs agreed in that respect. Detectable and attributable trends occur over only 9% of the land surface of the Earth. Over the US there are detectable trends over only a few regions in the SW.

p. 2-18: "There is robust evidence that human-caused warming has contributed to increases in the frequency and severity of the heaviest precipitation events across nearly 70% of the US."

Attributed to two papers:

Diffenbaugh, N.S., D. Singh, and J.S. Mankin, 2018: Unprecedented climate events: Historical changes, aspirational targets, and national commitments. *Science Advances*, **4** (2), 3354. <https://doi.org/10.1126/sciadv.aao3354>

And

Kirchmeier-Young, M.C. and X. Zhang, 2020: Human influence has intensified extreme precipitation in North America. *Proceedings of the National Academy of Sciences of the United States of America*, **117** (24), 13308-13313. <https://doi.org/10.1073/pnas.1921628117>

Diffenbaugh et al. present ratios of occurrences of extreme events to natural-only simulations from CMIP6 models. They report that for 79% of the U.S. extreme rainfall events are currently greater than frequencies in the models, and the ratio of occurrences will rise under future warming simulations. This is not "robust" evidence of anthropogenic influence, it only shows a discrepancy between models and observations which the authors interpret as evidence of anthropogenic forcing, on the assumption that the discrepancies would disappear if anthropogenic forcing were introduced. However they present no confirmation of that claim.

Kirchmeier-Young and Zhang looked at extreme 1- and 5-day events in North America and, using 3 GCMs, found "A signal of combined anthropogenic and natural external forcing can be detected in the intensification of extreme precipitation at the continental scale over North America. In some cases, this intensification can be attributed to human influence specifically." However they noted large differences among the three models in their simulated precipitation changes. Also, 2 of the 3 models failed to yield detection for Rx5Day for the NA mean. Finally the authors used TLS, a biased estimation method. Here again this is not "robust" evidence, it is suggestive but other studies have found natural variability predominant.

- 2-19 drought risk. Again a weird trend metric: Colorado River streamflow over 2000-2014 was 19% lower than the 20th century average. Droughts lasting longer and this is not temporary it is a drier "new normal". This is attributed to

Overpeck, J.T. and B. Udall, 2020: Climate change and the aridification of North America. *Proceedings of the National Academy of Sciences of the United States of America*, **117** (22), 11856-11858. <https://doi.org/10.1073/pnas.2006323117>

But this article is only a commentary and does not present any new research. It notes some changes and discusses in qualitative terms that they might be indicators of what's to come in the future.

Only need a few such examples to call into question the carefulness of the research behind the report.

Uncritical definition of scientific “advances” [McKittrick]

p. 3-13ff “New Data and Analysis Methods Have Advanced Climate Science”

This section treats release of new scenarios as a scientific “advance” without addressing the failure of previous scenarios to match reality or the likelihood that the new ones fail in the same regard. It also reports availability of large model ensembles as an advance, without addressing ways in which models are getting worse in some key respects. It also equates the increased use of rapid Extreme Event Attribution as an advance, without assessing whether the technique is valid in the first place.

Emergent constraints likewise discussed in completely uncritical terms:

An approach to reduce uncertainty in climate change projections has matured over the past decade. It is known as “emergent constraints.” The term refers to strong statistical relationships between highly uncertain future climate parameters and observable trends or variations in the current climate, along with a physical explanation of this relationship.

They fail to discuss any studies showing Emergent Constraints patterned on CMIP5 models failed to work on CMIP6 models, E.g.

- Manuel Schlund, Axel Lauer, Pierre Gentine, Steven C. Sherwood, and Veronika Eyring (2020) Emergent constraints on equilibrium climate sensitivity in CMIP5: do they hold for CMIP6? *Earth System Dynamics* 11 1233-1258 <https://doi.org/10.5194/esd-11-1233-2020>

Shows that emergent constraint relationships derived for CMIP5 models fail badly in CMIP6 models:

In this study, we systematically analyze 11 published emergent constraints on ECS that have mostly been derived from models participating in the Coupled Model Intercomparison Project Phase 5 (CMIP5) project... The focus of the study is on testing if these emergent constraints hold for ESMs participating in the new Phase 6 (CMIP6). Since none of the emergent constraints considered here have been derived using the CMIP6 ensemble, CMIP6 can be used for cross-checking of the emergent constraints on a new model ensemble. **The application of the emergent constraints to CMIP6 data shows a decrease in skill and statistical significance of the emergent relationship for nearly all constraints, with this decrease being large in many cases.** Consequently, the size of the constrained ECS ranges (66% confidence intervals) widens by 51% on average in CMIP6 compared to CMIP5.

Yet the introduction of emergent constraints is treated as a great “advance” in NCA5.

Sweeping generalizations regarding complex matters [McKittrick]

Example: US precipitation changes.

pp. 2-18-19

“Rainfall is becoming more extreme”

Since the 1950s, there has been an upward trend in heavy precipitation across the contiguous US. This increase is driven largely by more frequent precipitation extremes, with relatively smaller changes in their intensity. The largest increase in the number of extreme precipitation days (defined as the top 1% of heaviest precipitation events) has occurred over the Northeast (an increase of around 60%) and Midwest (around 45%), along with increases of more than 10% in their annual and 5-year maximum amount (Figure 2.8). These changes have contributed to increases in river and stream flooding in these regions. The increase in frequency and intensity of precipitation extremes is evident across a broad range of event durations (from 1 to 30 days) and return intervals (1 to 20 years), particularly east of the Rocky Mountains.

There is robust evidence that human-caused warming has contributed to increases in the frequency and severity of the heaviest precipitation events across nearly 70% of the US. Paleoclimate records derived from tree-ring growth provide evidence that summer moisture has increased over the past century in parts of New England, the central-eastern US, and the northern Mississippi River valley.

Here is a more accurate summary of what the data show based on a sample of 141 very long (>130 years) records of daily precipitation.

There are regionally-heterogenous changes in average and extreme precipitation. Positive trends in annual average rainfall and extreme events (defined either as the annual maximum or the number of exceedances of the 99th percentile value) are generally weak or non-existent when looking at samples exceeding 130 years in length. Significant trends can be found when beginning the sample in the 1950s although in most cases the trends weaken and become

insignificant when looking at the post-1980 interval. This makes attribution to anthropogenic warming difficult.

Along the Pacific coast very few stations (1 or 2 out of 29) exhibit significant trends on any time scale in any metric and the region-wide trends are insignificant.

In the Southeast region about 5 out of 24 stations exhibit positive trends in average and extreme precipitation metrics and the regional trends are likewise significant, but only on samples beginning in 1950. When the sample starts in 1873 or 1980 the trends weaken and become mostly insignificant.

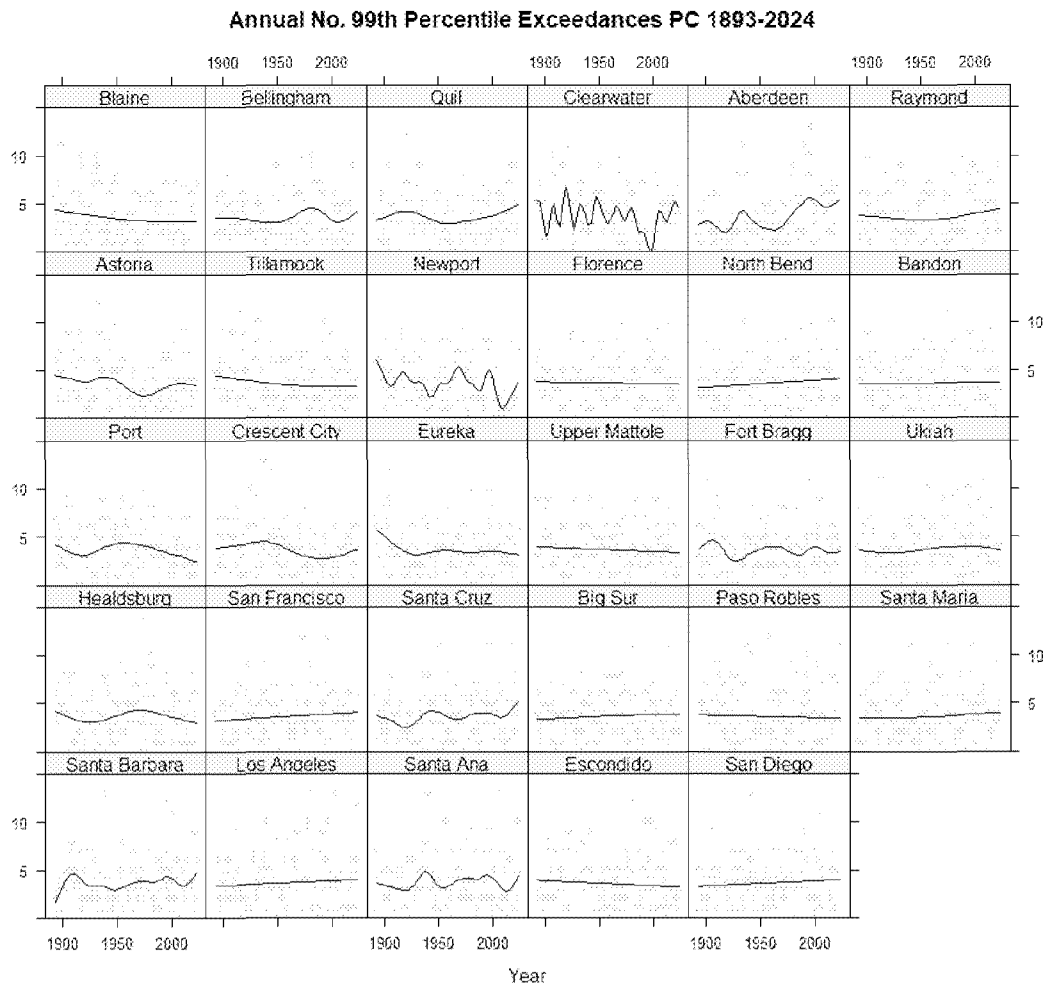
In the Midwest region nearly half the stations exhibit positive and significant trends in average precipitation since 1893 (23/61) and 1950 (28/61) but the trends weaken after 1980: only 6/61 locations are significant and the region-wide trend is insignificant. Regional trends in max and 99th percentile exceedances are insignificant post-1893 and -1980 but the latter are positive and significant post-1950.

In the Northeast region 12 out of 27 stations exhibit positive and significant increases in average precipitation post-1888, post-1950 and post-1980 (10/27) and the regional trend is positive and significant in all three intervals. The regional number of 99th percentile exceedances has a positive trend post-1950 and post-1980 but not post-1888. The significant positive trends post-1980 are concentrated in NH but are insignificant elsewhere.

Consequently, precipitation in the U.S. exhibits considerable regional and temporal variability. Relatively more places became wetter than drier. In the Midwest and Northeast the general pattern since 1950 favors increased precipitation depending on the location, although trends since 1980 have not tended to be statistically significant.

Data details in the following pages.

PACIFIC COAST



Since 1893:

	No. stns	+ trends	- trends	region
1-day average	29	0	1	(-)
2-day average	29	0	1	(-)
Avg on non-zero days	29	0	9	--
Variability	29	1	0	(+)
Annual max	29	2	1	(+)
Number of 99 th pct exceedances	29	1	0	(-)

(-) neg insignificant, -- neg significant, (+) pos insignificant, ++ pos significant.

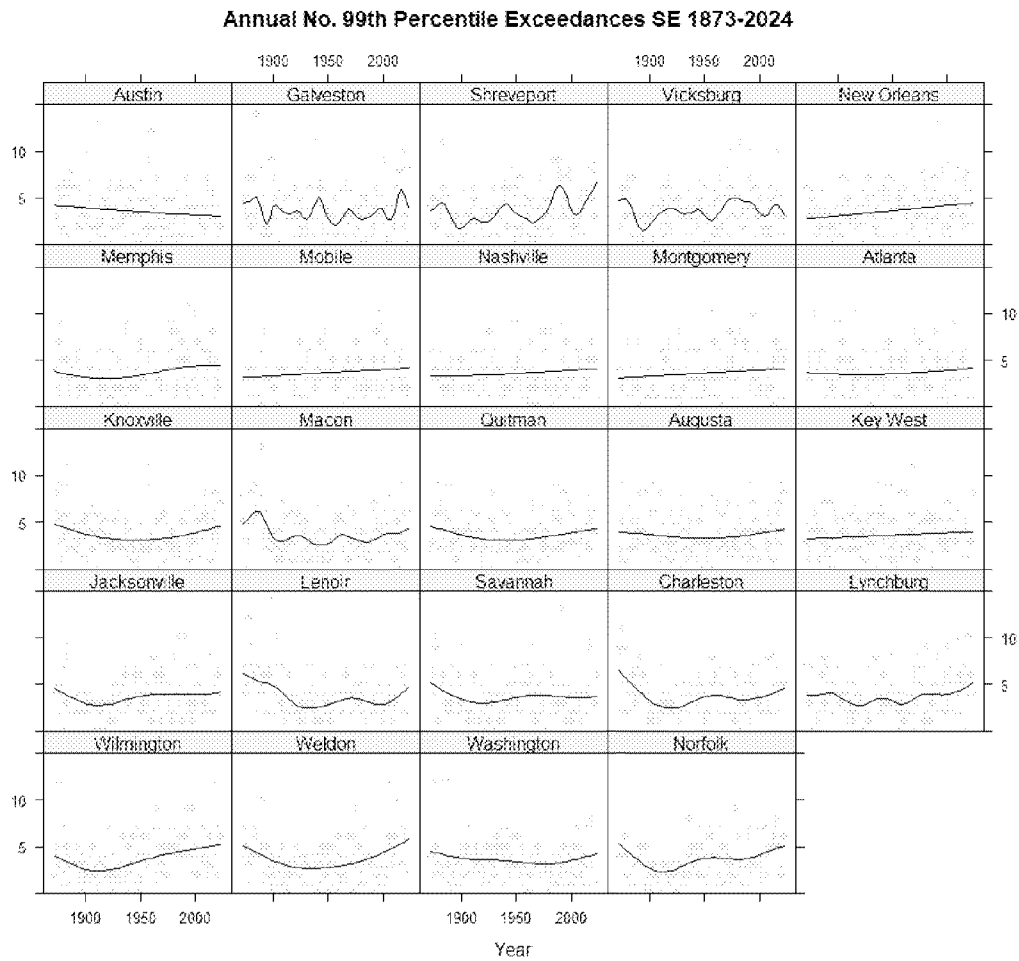
Since 1950:

	No. stns	+ trends	- trends	region
1-day average	29	0	1	(-)
2-day average	29	0	1	(-)
Avg on non-zero days	29	0	4	(-)
Variability	29	2	3	(-)
Annual max	29	6	3	(-)
Number of 99 th pct exceedances	29	2	1	(-)

Since 1980:

	No. stns	+ trends	- trends	region
1-day average	29	0	0	(-)
2-day average	29	0	0	(-)
Avg on non-zero days	29	0	1	(-)
Variability	29	0	0	(-)
Annual max	29	2	1	(-)
Number of 99 th pct exceedances	29	0	0	(+)

SOUTHEAST



Since 1873:

	No. stns	+ trends	- trends	region
1-day average	24	1	1	(+)
2-day average	24	1	1	(+)
Avg on non-zero days	24	7	2	(+)
Variability	24	1	0	(+)
Annual max	24	2	0	(+)
Number of 99 th pct exceedances	24	5	0	(+)

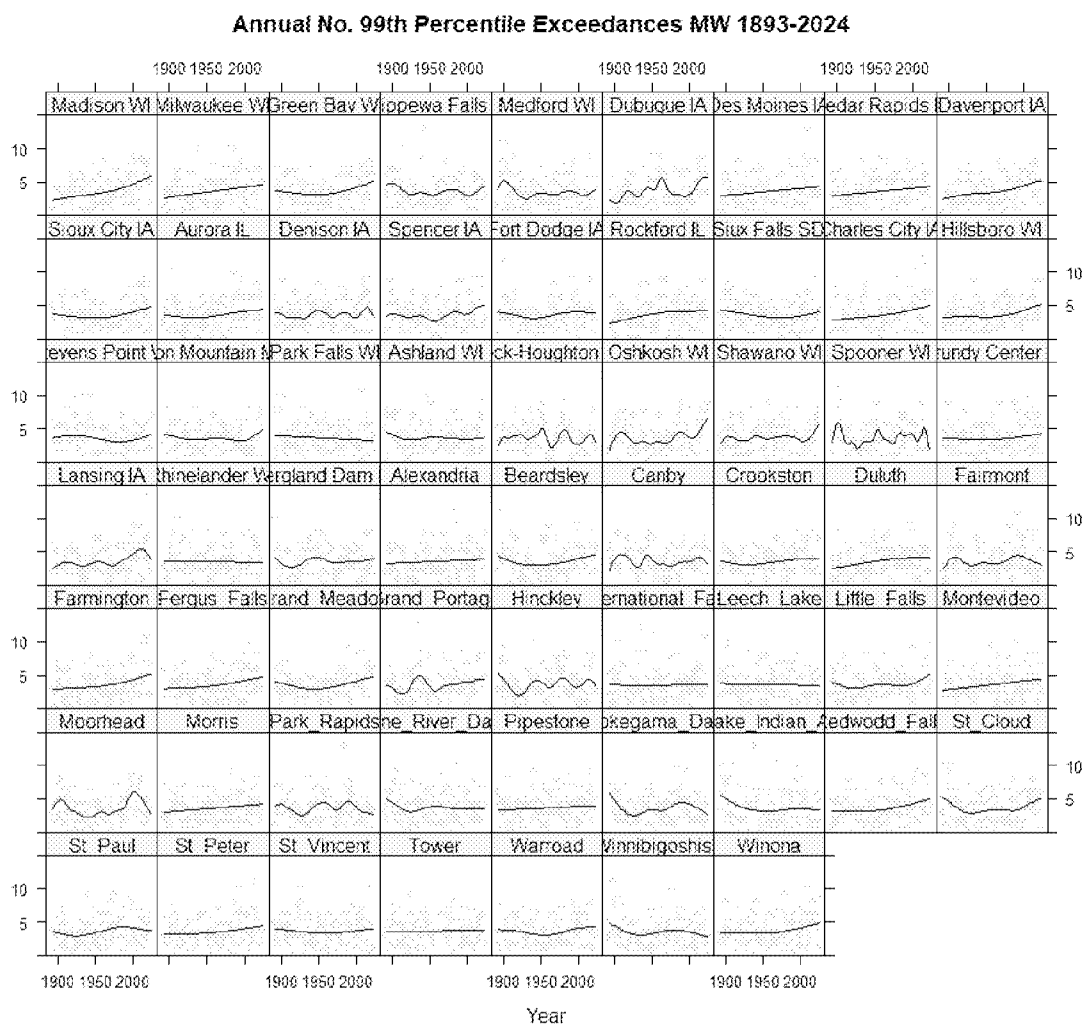
Since 1950:

	No. stns	+ trends	- trends	region
1-day average	24	5	0	++
2-day average	24	5	0	++
Avg on non-zero days	24	5	1	++
Variability	24	6	0	++
Annual max	24	4	0	++
Number of 99 th pct exceedances	24	4	0	(+)

Since 1980:

	No. stns	+ trends	- trends	region
1-day average	24	5	0	(+)
2-day average	24	5	0	(+)
Avg on non-zero days	24	5	1	(+)
Variability	24	3	0	(+)
Annual max	24	4	0	(+)
Number of 99 th pct exceedances	24	4	0	(+)

MIDWEST



Since 1893:

	No. stns	+ trends	- trends	region
1-day average	61	23	0	++
2-day average	61	23	0	++
Avg on non-zero days	61	2	12	(+)
Variability	61	12	0	++
Annual max	61	9	0	(+)
Number of 99 th pct exceedances	61	10	0	(+)

Since 1950:

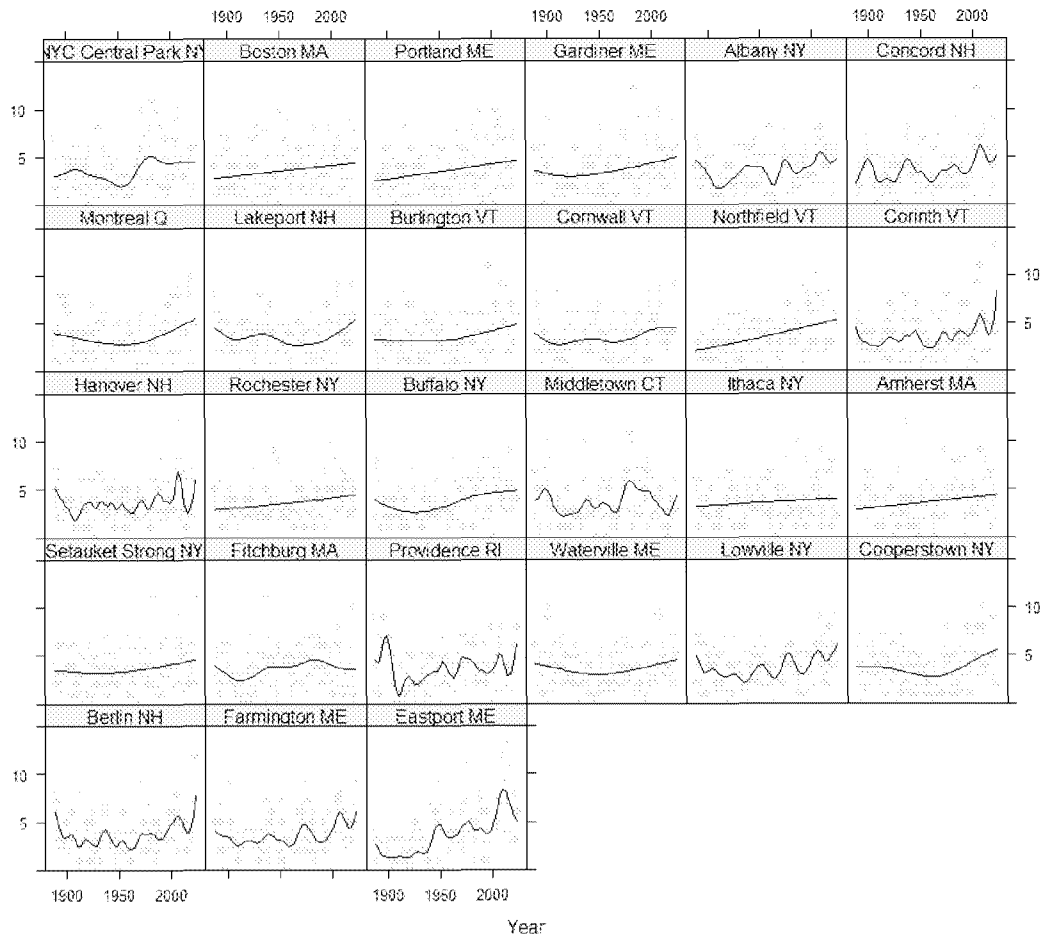
	No. stns	+ trends	- trends	region
1-day average	61	28	2	++
2-day average	61	28	2	++
Avg on non-zero days	61	11	1	++
Variability	61	16	0	(+)
Annual max	61	8	0	(+)
Number of 99 th pct exceedances	61	19	0	++

Since 1980:

	No. stns	+ trends	- trends	region
1-day average	61	6	1	(+)
2-day average	61	6	1	(+)
Avg on non-zero days	61	8	2	(+)
Variability	61	5	1	(+)
Annual max	61	0	1	(+)
Number of 99 th pct exceedances	61	5	3	(-)

NORTHEAST

Annual No. 99th Percentile Exceedances NE 1888-2024



Since 1888:

	No. stns	+ trends	- trends	region
1-day average	27	12	0	++
2-day average	27	12	0	++
Avg on non-zero days	27	7	1	(+)
Variability	27	4	0	(+)
Annual max	27	3	0	(-)
Number of 99 th pct exceedances	27	5	0	(+)

Since 1950:

	No. stns	+ trends	- trends	region
1-day average	27	12	0	++
2-day average	27	12	0	++
Avg on non-zero days	27	7	1	(+)
Variability	27	4	0	(+)
Annual max	27	3	0	(-)
Number of 99 th pct exceedances	27	5	0	++

Since 1980:

	No. stns	+ trends	- trends	region
1-day average	27	10	1	++
2-day average	27	10	1	++
Avg on non-zero days	27	6	0	(+)
Variability	27	2	0	(+)
Annual max	27	1	0	(+)
Number of 99 th pct exceedances	27	1	1	++

Projections of Sea Level Rise [Curry]

The NCA5 states: "Global average sea levels over the past decade were also higher than in the preindustrial period by between 7 and 9.5 inches, with more than half of this rise occurring since 1980." The issue with the NCA5 is not related to observed levels of sea level rise, but rather to their projections to 2050 and 2100.

The sea level rise scenarios used in the NCA5 do not relate directly to the SSP emissions scenarios, but to specified amounts of sea level rise by 2100, whereby Low relates to 0.3 m (0.98 feet), Intermediate-Low relates to 0.5 m (1.64 feet), Intermediate relates to 1.0 m (3.28 feet), Intermediate-High relates to 1.5 m (4.92 feet), and High relates to 2.0 m (6.56 feet). (Table 4 of Guide to Using this Report).

Table 4. Descriptive Terms for Common Sea Level Rise Scenarios Used in NCA5

Future global mean sea level rise and sea level rise along United States coastline are shown for five scenarios in feet (and meters), relative to a 2000 baseline. The US values shown in the right half of the table are averaged across the US coastal regions, including the contiguous US, Alaska, Hawaii and the US-Affiliated Pacific Islands, and the US Caribbean. The national values shown in the table differ substantially from regional values. For example, sea level rise is higher in the Gulf Coast and lower or even negative in some parts of Alaska. In the next 30 years (2020–2050), sea level along the contiguous US coasts is expected to rise 0.92 feet (0.28 m), the same amount of sea level rise observed over the last 100 years (1920–2020). See Chapter 9 for regional sea level information. Adapted from Sweet et al. 2022.”

Sea Level Rise Scenario Descriptor	Global Mean Sea Level			United States		
	2050	2100	2150	2050	2100	2150
Low	0.49 (0.15)	0.98 (0.3)	1.31 (0.4)	0.59 (0.18)	0.98 (0.3)	1.64 (0.5)
Intermediate-Low	0.66 (0.20)	1.64 (0.5)	2.62 (0.8)	0.75 (0.23)	1.64 (0.5)	2.95 (0.9)
Intermediate	0.92 (0.28)	3.28 (1.0)	6.23 (1.9)	0.89 (0.27)	3.28 (1.0)	6.89 (2.1)
Intermediate-High	1.21 (0.37)	4.92 (1.5)	8.86 (2.7)	1.12 (0.34)	4.92 (1.5)	8.86 (2.7)
High	1.41 (0.43)	6.56 (2.0)	12.14 (3.7)	1.38 (0.42)	6.56 (2.0)	12.46 (3.8)

Considering only projections representing processes in whose quantification there is at least medium confidence, the IPCC AR6 assessed global mean sea level projections for 2100 to fall between 0.2 and 1.6 m for the 5th—95th percentile range, for all scenarios ranging from RCP2.6 to RCP8.5. The IPCC AR6 cites values as high as 2.4 m at the upper end of the 95th percentile range for RCP8.5, if estimates include the hypothesized Marine Ice Cliff Instability (low confidence).

The range of sea level rise scenarios considered by the NCA5 includes Intermediate-High and High values associated with the implausible extreme emissions scenario RCP8.5 and processes in which there is low confidence in understanding. And neglects to include plausible lower scenarios, such as 0.2 m cited by the IPCC, that corresponds to the average rate of sea level rise over the past century.

Chapter 9 of the NCA states: “Under a range of potential global warming levels, average sea level along US coastlines is *likely* to be between 12 and 20 inches above 2000 sea levels in 2050 (Figure 9.2).” These values of sea level rise encompass the Intermediate scenario to values slightly higher than the High scenario.

Global sea level rise projections to 2050 relative to a 2000 baseline can be evaluated with respect to the observed global sea level rise from 2000-2024, which is approximately 3.39 inches (0.28 feet).

<https://www.climate.gov/news-features/understanding-climate/climate-change-global-sea-level>

Hence it is inferred that NCA5 is projecting values of sea level rise between 2025 and 2050 that are 3.5 to 5.8 times the rate observed during 2000-2024.

Chapter 9 further states: “Looking toward the future, an 11 inch 28 cm average rise along the contiguous US coastline is expected by 2050 (relative to 2020), with a *likely* range of 9-13 inches.” This analysis accounts for the observed sea level rise between 2000 and 2020.

With regards to confidence levels, NCA5 Chapter 9 Traceable Accounts states: “There is *high confidence* and it is *likely* that sea levels will rise about 11 inches (likely range of about 9–13 inches) between 2020 and 2050” Neither the statement nor the context in the paragraph does not distinguish as to whether this refers to global sea level rise, or US average sea level rise, although it is inferred to refer to global sea level rise.

In summary, the NCA5 presents future sea level rise scenarios that are not directly relatable either to SSP/RCP emissions scenarios or global warming levels. The NCA5 scenarios include two scenarios that are higher than the 95th percentile for the extreme emissions scenario RCP8.5 and include hypothesized ice sheet processes for which there is low confidence. Projections to 2050 require rates of sea level rise during 2025 through 2050 that are more than three times the rate observed during 2020-2024. Further, the NCA5 ascribes high confidence to these sea level rise projections.

Hurricanes [Curry]

NCA5 Key message 2.2: “Hurricanes have been intensifying more rapidly since the 1980s (high confidence) and causing heavier rainfall and higher storm surges (high confidence).”

The justification for the *high confidence* conclusion on more rapid intensification of hurricanes is based on two citations. Kishtawal et al. (2012) examined data over the period 1986-2010 and Bhatia et al. (2019) considered satellite data on global hurricanes over a short period from 1982 to 2009 – short periods that are confounded by natural variability.

No justification for the *high confidence* conclusion on higher storm surges is provided in Chapter 2. The Knutson et al. (2019) assessment cited in Chapter 2 in a different context includes the following statement: “there is only low confidence for detection or attribution of an anthropogenic influence on the surge events.”

No justification is provided for the *high confidence* conclusion regarding hurricanes causing heavier precipitation. The Knutson et al. (2019) assessment cited in Chapter 2 in a different context includes the following statement: “However, no observational studies have provided convincing evidence of a detectable anthropogenic influence specifically on hurricane-related precipitation.”

In the Traceable Accounts section, Description of Confidence and Likelihood: “Basic physical understanding and climate models both provide robust explanations for the links between climate change and observed changes in these extremes: this is why the authors also have high confidence that storms are delivering more rainfall and high confidence that storm surges are becoming higher.”

In short, the NCA5 provides no observational basis for their high confidence assertions that hurricanes are causing heavier rainfall and higher storm surges; instead they rely on basic

physical understanding and climate model simulations. The high confidence assertion regarding increasing rates of intensification is based on two papers with relatively short data records that are confounded by natural variability.

HURRICANE DAMAGE STUFF FORTHCOMING NOTES BELOW

hurricane damage in the United States has generally increased since 1900.¹⁵⁹
Changes in smaller-scale, short-lived severe weather

There has been a 17% decrease in the speed of movement of storms in the North Atlantic basin since 1900,¹⁵⁷ as well as an increased tendency for storms along the North American coast to meander and stall since the 1950s.¹⁵⁸

There is no long-term trend in the frequency of landfalling hurricanes in the United States since the late 19th century, but there has been an increase in basin-wide hurricane activity in the North Atlantic since the early 1970s.

152 153

, In addition to recent increases in storm frequency, evidence continues to build that hurricanes are changing in other dangerous ways. Tropical cyclones have been intensifying more rapidly

since the early 1980s,

154 155

, leaving communities with less time to prepare. Hurricanes tend to lose energy as they move away from the ocean, but the rate of this hurricane decay has slowed since the 1960s, allowing storms to extend somewhat farther inland.¹⁵⁶ There has been a 17% decrease in the speed of movement of storms in the North Atlantic basin since 1900,¹⁵⁷ as well as an increased tendency for storms along the North American coast to meander and stall since the 1950s.¹⁵⁸ Slower-moving storms can result in more heavy rainfall, wind damage, storm surge, and coastal flooding; notably, after accounting for changes in the value of property and other assets placed in harm's way, hurricane damage in the United States has generally increased since 1900.¹⁵⁹

Knutson, T., S.J. Camargo, J.C.L. Chan, K. Emanuel, C.-H. Ho, J. Kossin, M. Mohapatra, M. Satoh, M. Sugi, K. Walsh, and L. Wu, 2019 : Tropical cyclones and climate change assessment: Part I: Detection and attribution. Bulletin of the American Meteorological Society, 100 (10), 1987-2007. <https://doi.org/10.1175/ams-d-18-0189.1>

153. Vecchi, G.A., C. Landsea, W. Zhang, G. Villarini, and T. Knutson, 2021 : Changes in Atlantic major hurricane frequency since the late-19th century. Nature Communications, 12 (1), 4054. <https://doi.org/10.1038/s41467-021-24268-5>

154. Bhatia, K.T., G.A. Vecchi, T.R. Knutson, H. Murakami, J. Kossin, K.W. Dixon, and C.E. Whitlock, 2019: Recent increases in tropical cyclone intensification rates. *Nature Communications*, 10 (1), 635. <https://doi.org/10.1038/s41467-019-08471-z>
155. Kishtawal, C.M., N. Jaiswal, R. Singh, and D. Niyogi, 2012: Tropical cyclone intensification trends during satellite era (1986-2010). *Geophysical Research Letters*, 39 (10). <https://doi.org/10.1029/2012gl051700>
156. Li, L. and P. Chakraborty, 2020: Slower decay of landfalling hurricanes in a warming world. *Nature*, 587 (7833), 230-234. <https://doi.org/10.1038/s41586-020-2867-7>
157. Kossin, J.P., 2019: Reply to: Moon, I.-J. et al.; Lanzante, J. R. *Nature*, 570 (7759), E16-E22. <https://doi.org/10.1038/s41586-019-1224-1>
158. Hall, T.M. and J.P. Kossin, 2019: Hurricane stalling along the North American coast and implications for rainfall. *npj Climate and Atmospheric Science*, 2 (1), 1-9. <https://doi.org/10.1038/s41612-019-0074-8>
159. Grinsted, A., P. Ditlevsen, and J.H. Christensen, 2019: Normalized US hurricane damage estimates using area of total destruction, 1900-2018. *Proceedings of the National Academy of Sciences of the United States of America*, 116 (48), 23942-23946. <https://doi.org/10.1073/pnas.1912277116>

https://rogerpielkejr.substack.com/p/apples-oranges-and-normalized-hurricane?utm_source=publication-search

<https://journals.ametsoc.org/view/journals/apme/64/4/JAMC-D-24-0222.1.xml>

In summary, from a Type I error avoidance perspective, a slight majority of the authors (6 of 11) had only low confidence that there has been a detectable decrease in global or western North Pacific TC translation speeds since 1949. For the other five authors, four had low-to-medium confidence, and one had medium confidence). Most authors (eight of 11) concluded that there was only low confidence that anthropogenic forcing had contributed to the observed decrease. Alternatively, from the perspective of reducing Type II errors, most authors (eight of 11) concluded that the balance of evidence suggests there has been a detectable decrease in global

TC translation speeds since 1949; only one author concluded that the balance of evidence suggests that anthropogenic forcing has contributed to the observed decrease.

RCP8.5 [Curry]

(not as simple as it seems, they rely a lot on critical warming levels)

Ambiguous Use of “climate change” [Koonin]

[text to come]

Misrepresentation of Historical Data [Koonin]

[Text to come]

Misrepresentation of the Potential of Wind/Solar Generation

[text to come]

About the Authors

John Christy, Ph.D. is the Distinguished Professor of Atmospheric and Earth Sciences and Alabama's State Climatologist at the University of Alabama in Huntsville. He has a B.A. (Mathematics) from CSU Fresno and an M.S. and Ph.D. (Atmospheric Sciences) from the University of Illinois in Urbana-Champaign. He is a Fellow of the American Meteorological Society and recipient of The NASA Medal for Exceptional Scientific Achievement for constructing, with Dr. Roy Spencer, the first global atmospheric temperature dataset from polar orbiting satellites. He served as Lead Author of the 3rd IPCC Assessment Report (2001), he has coauthored National Academy of Science expert reports on Climate Observations (1995) and Surface Temperature Reconstructions (2006), and he has served on the NOAA Climate Change Science Program, NASA's Earth Science Subcommittee, the National Research Council Space Studies Board and the EPA Science Advisory Board. In addition, Dr. Christy has given testimony in 20 Congressional Hearings.

Judith Curry, Ph.D. is Professor Emerita at the Georgia Institute of Technology, where she served as Chair of Earth and Atmospheric Sciences for 13 years. She is President and co-founder of Climate Forecast Applications Network (CFAN). Curry has a PhD in Geophysical Sciences from the University of Chicago. She has authored or coauthored 192 peer-reviewed papers in atmospheric and climate sciences, two textbooks, and most recently the book *Climate Uncertainty and Risk*. Curry is a Fellow of the American Meteorological Society, the American Association for the Advancement of Science, American Geophysical Union, and a Member of the American Academy of Sciences and Letters.

The Honorable Steven E. Koonin, Ph.D. is the Edward Teller Senior Fellow at Stanford's Hoover Institution. He has served as Under Secretary for Science at the Department of Energy (2009-2011), as Chief Scientist for British Petroleum (2004-2009), and as a professor at Caltech (1975 – 2004, the last nine years as Vice President and Provost). Koonin is a member of the National Academy of Sciences and the JASON group of government advisors, as well as a Governor of Lawrence Livermore National Laboratory, having served in similar capacities for the Los Alamos, Sandia, Brookhaven, and Argonne National Laboratories. Other prior roles include a University Professor at New York University, a non-resident Senior Fellow at the American Enterprise Institute, and a Trustee of the Institute for Defense Analyses, and Chair of the NASEM Divisional Committee for Engineering and Physical Sciences (2014-2019). Koonin

has a BS in Physics from Caltech and a PhD in Theoretical Physics from Massachusetts Institute of Technology. He authored the 2021 bestseller *Unsettled: What Climate Science Tells Us, What It Doesn't, and Why It Matters*, the 1985 textbook *Computational Physics*, and some 200 peer-reviewed papers in physics and astrophysics, scientific computation, energy technology and policy, and climate science.

Ross McKittrick, Ph.D., is a Professor of Environmental Economics at the University of Guelph in Ontario, Canada. He holds a BA in economics from Queen's University, and an MA and Ph.D. in economics from the University of British Columbia. He has published widely in both economics and physical science journals on topics related to climate change, pollution and public policy. His book *Economic Analysis of Environmental Policy* was published by the University of Toronto Press in 2010. His background in applied statistics has led him to author or coauthor peer-reviewed publications across a wide range of topics in the physical sciences including paleoclimate reconstruction, malaria transmission, surface temperature measurement, climate attribution methodology and climate model evaluation. Professor McKittrick has made many invited academic presentations around the world, and has testified before the U.S. Congress and committees of the Canadian House of Commons and Senate.

Roy W. Spencer, Ph.D., is a Principal Research Scientist at the University of Alabama in Huntsville. He holds a BS in Atmospheric and Oceanic Science from the University of Michigan, and MS and PhD in Meteorology from the University of Wisconsin -Madison. Spencer's published research has focused on monitoring of weather processes and climate change from Earth-orbiting satellites, as well as using simple physical models for diagnosing climate sensitivity and climate feedbacks. As a NASA Senior Scientist for Climate Studies he served as the U.S. Science Team Leader for the Advanced Microwave Scanning Radiometer (AMSR-E) flying on the Aqua satellite, providing our most accurate global measurements of sea surface temperatures, sea ice, and several other features of the climate system. Along with Dr. John Christy, Spencer developed the first satellite-based technique for global temperature monitoring, for which they received NASA's Exceptional Scientific Achievement Medal and the American Meteorological Society's Special Award.

From: Ross McKittrick [ross.mckittrick@gmail.com]
Sent: 7/8/2025 3:08:16 PM
To: John Christy [climateman60@gmail.com]
CC: Judith Curry [curry.judith@gmail.com]; Steve Koonin [steven.koonin@gmail.com]; Roy Spencer [roywspencer@hotmail.com]; Travis Fisher [travis.scott.fisher@gmail.com]; Josh Loucks [loucksj14@gmail.com]; Seth Cohen [seth.cohen@hq.doe.gov]
Subject: Re: Texas flooding

100% agree

On Tue, Jul 8, 2025 at 10:55 AM John Christy <climateman60@gmail.com> wrote:
Ross

I noticed in NCA5 Fig. 26.11 that "More heavy rainfall events" is the dogmatic assumption which then motivates the vague generalities about action (that I believe a high-school science class could have formulated). I don't see anywhere a statement "From historical records, determine the probabilities of various levels of flooding, their frequencies and the subsequent risk they imply to infrastructure and lives. Then, address these known risks, which evidence indicates are not being worsened by changes in the background physical climate."

John C.

On Mon, Jul 7, 2025 at 4:01 PM Ross McKittrick <ross.mckittrick@gmail.com> wrote:

I was responding to your suggestion of a case study. I think a brief overview of the event is warranted. The tie-in to the report is that NCA proponents claim their work product is a critical tool for state and local officials to plan their responses to climate change, and its failure on that score is conspicuous. We could say the same about its usefulness for preventing the LA wildfire disaster.

On Mon, Jul 7, 2025 at 4:49 PM Judith Curry <curry.judith@gmail.com> wrote:

Ross, I like the material in this email (below) better than the text you sent. It focuses on deficiencies of NCA5, rather than what really went on with the floods (which seems a bit off topic for the NCA5 critique)

On Sun, Jul 6, 2025 at 7:51 AM Ross McKittrick <ross.mckittrick@gmail.com> wrote:

I looked at NCA5 from the perspective of someone who might have looked to it in recent times for guidance on dealing with flood hazards in Texas (ch 26). Here's the first bit of advice

Key Message 26.1

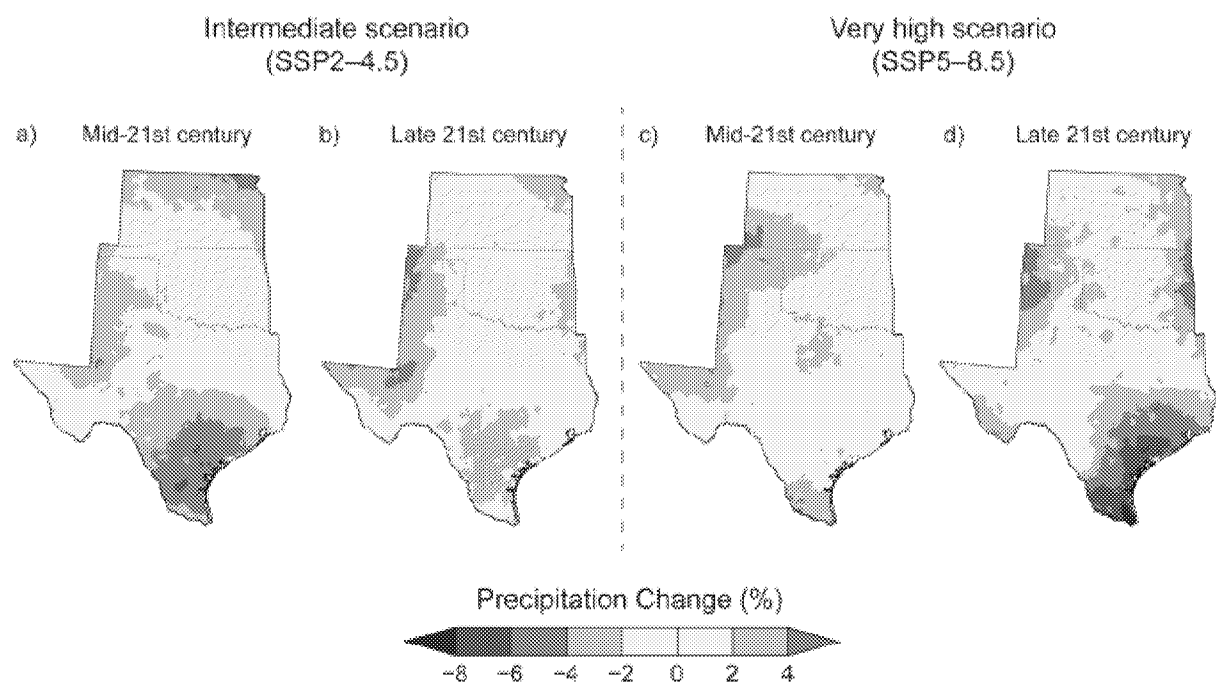
How We Live: Climate Change Is Degrading Lands, Waters, Culture, and Health

Climate change is beginning to alter how we live in the Southern Great Plains, putting us at risk from climate hazards that degrade our lands and waters, quality of life, health and well-being, and cultural interconnectedness (*high confidence*). Many climate hazards are expected to become more frequent, intense, or prolonged; to broaden in spatial extent; and to result in more people experiencing costly, deadly, or stressful climate-related conditions (*very likely, high confidence*). To address the growing risk, effective climate-resilient actions include implementing nature-based solutions; valuing Indigenous, traditional, and local knowledges; and infusing climate change solutions into community planning (*medium confidence*).

The chapter is mostly vague generalities about how everything is getting worse for everyone everywhere, and how nice it is that more wind and solar are being deployed.

Very little about precipitation risks. The projections are for less rainfall in South Texas:

Projected Change in Total Annual Precipitation



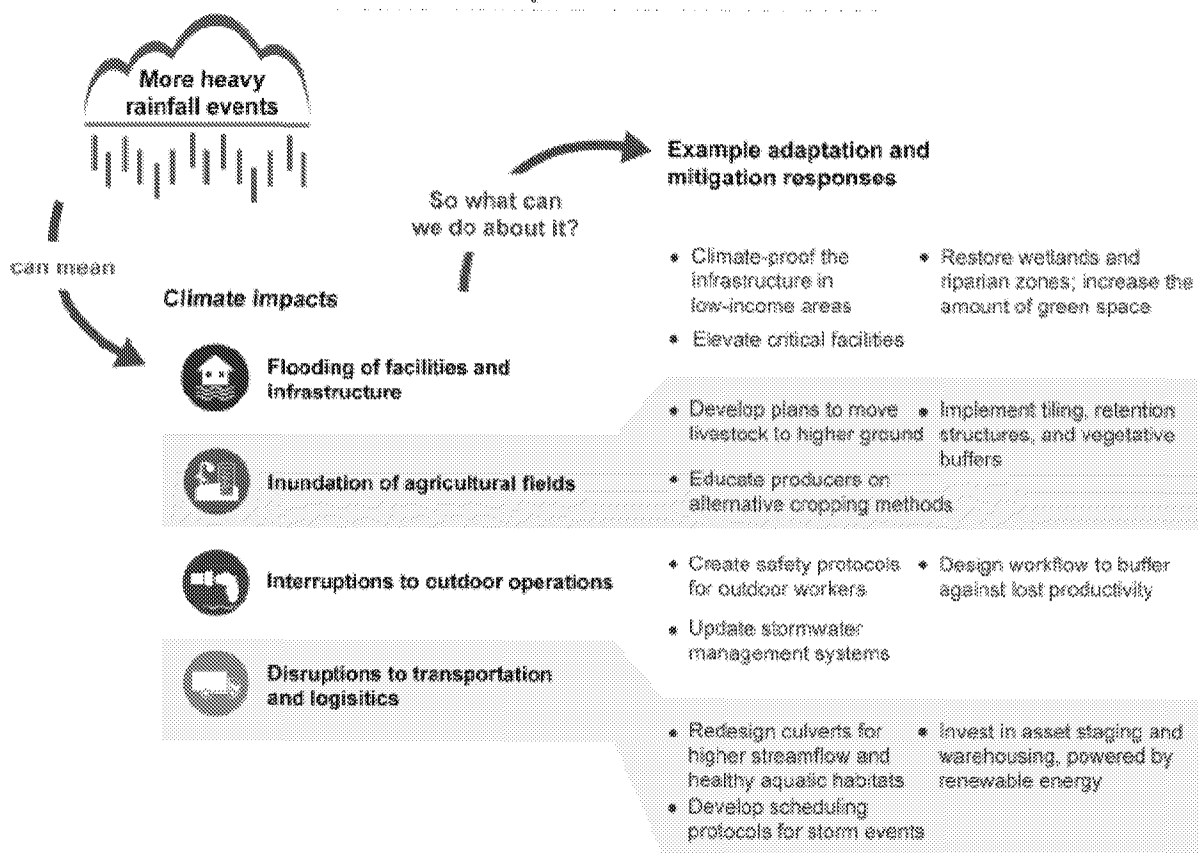
Slightly drier conditions are projected for much of the western and southern portions of the region by the end of the century.

Figure 26.10. In the future, drier conditions threaten agriculture and water supplies in parts of the Southern Great Plains (brown), while more precipitation is projected near the northern and eastern boundaries of the region (green). Under an intermediate scenario (SSP2-4.5), total annual precipitation is projected to decrease by 4% or more (as compared to the 1991–2020 average) in southern Texas by midcentury (a), with smaller differences expected by century's end (b). Under a very high scenario (SSP5-8.5), annual precipitation is projected to decline slightly in western portions of the region by midcentury (c) and by 4% or more in southeast and far northwest Texas by the century's end (d). Figure credit: See figure metadata for contributors.

The first discussion of adapting to heavy rainfall hazards (p. 26-22) is this bit of scientific guidance: Heavy rainfall and extreme temperatures cause sports teams to depend more on artificial or indoor environments, increasing participation costs and decreasing access to sports, especially for lower-income populations.¹³⁰ The Texas Rangers replaced their structurally sound stadium earlier than expected because extreme temperatures suppressed attendance.¹³⁵ The new stadium has a retractable roof for a climate-controlled environment. Sports events across all levels—from youth and interscholastic to collegiate and professional—have been halted or moved because of the unusual timing or intensity of storms (Figure 26.14, left), resulting in scheduling challenges, economic costs, and reduced social interactions.^{136,137} All people who enjoy the outdoors as part of their healthy lifestyle are expected to face more days with dangerous extreme heat (Figure 26.14, right).

Their adaptation advice is this (p. 26-19)

Resilience Actions to Address the Impacts of Heavier Rainfall Events on Businesses



Resilience actions can help businesses and industries reduce the negative consequences of more heavy rainfall events.

Figure 26.11. An increased number of heavy rainfall events affects business and industry across the Southern Great Plains through flooding of facilities and infrastructure, inundation of agricultural fields, interruptions to outdoor operations, and disruptions to transportation and logistics. The example adaptation and mitigation actions can increase resilience and reduce negative impacts. Figure credit: See figure metadata for contributors.

And no price is too high to pay for that level of insight.

The discussion of precipitation extremes in Ch 2 is so general they can point to it later and no matter what happens claim they warned about it:

Rainfall Is Becoming More Extreme

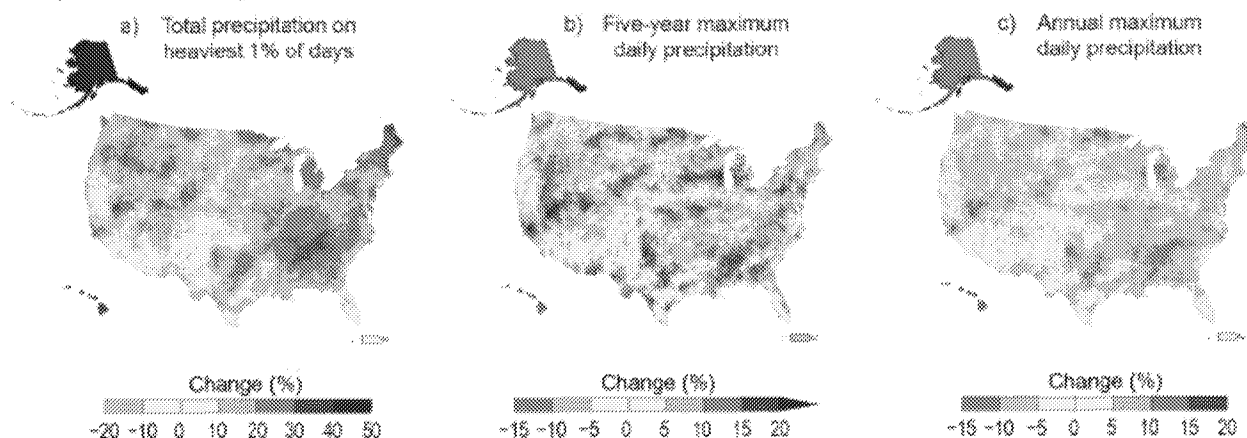
Since the 1950s, there has been an upward trend in heavy precipitation across the contiguous US (Figure 2.8).¹²³ This increase is driven largely by more frequent precipitation extremes, with relatively smaller changes in their intensity. The largest increase in the number of extreme precipitation days (defined as the top 1% of heaviest precipitation events) has occurred over the Northeast (an increase of around 60%) and Midwest (around 45%), along with increases of more than 10% in their annual and 5-year maximum amount (Figure 2.8). These changes have contributed to increases in river and stream flooding in these regions.^{123,124} The increase in frequency and intensity of precipitation extremes is evident across a broad range of event durations (from 1 to 30 days) and return intervals (1 to 20 years), particularly east of the Rocky Mountains.¹²⁵

There is robust evidence that human-caused warming has contributed to increases in the frequency and severity of the heaviest precipitation events across nearly 70% of the US.^{126,127} Paleoclimate records derived from tree-ring growth provide evidence that summer moisture has increased over the past century in parts of New England,¹²⁸ the central-eastern US,¹²⁹ and the northern Mississippi River valley.¹³⁰

2-18 | Climate Trends

But as we show, they lead with an untrue generalization and to the extent they get specific they don't mention the Southern Great Plains. The ch 2 projections (p. 2-25) are very ambiguous for Texas

Projected Changes to Precipitation Extremes at 2°C of Global Warming



Increases in the frequency and severity of heavy precipitation are expected at a global warming level of 2°C.

Figure 2.12. The maps show projected changes in three measures of extreme precipitation at a global warming level of 2°C: (a) total precipitation falling on the heaviest 1% of days, (b) daily maximum precipitation in a 5-year period, and (c) the annual heaviest daily precipitation amount. Changes are relative to the period 1991–2020. Based on LOCA2/STAR. Values for Alaska, Hawai'i, and Puerto Rico are averages from STAR downscaling of 45, 16, and 31 stations, respectively. Data were not available for the US-Affiliated Pacific Islands and the US Virgin Islands. Figure credit: NOAA NCEI and CISS NC.

in sum the NCA5 was totally useless for anyone charged with disaster management and planning for weather-related hazards in that region.

On Sun, Jul 6, 2025 at 9:51 AM Judith Curry <curry.judith@gmail.com> wrote:
yes CM told me at the AMS meeting, he is very excited.

On Sun, Jul 6, 2025 at 6:29 AM John Christy <climateman60@gmail.com> wrote:
Hunt TX is near the headwaters of the Guadalupe/ South Fork Guadalupe Rivers. So, heavy rain would show more rapid response near Hunt than downstream at Kerrville. We can say that the Hill Country is subject to very intense events thus threatening infrastructure and lives within the floodplains as historical records indicate.

Chris Martz will start his MS with UAH in the fall.

John C.

Sent from my iPhone

On Jul 6, 2025, at 8:08 AM, Judith Curry <curry.judith@gmail.com> wrote:

oops this was from Chris Martz

On Sun, Jul 6, 2025 at 6:07 AM Judith Curry <curry.judith@gmail.com> wrote:
Just spotted this on twitter from Matthew Wielicki

The maximum 24-hour rainfall in Texas from Barry's remnants on Thursday-Friday was 18-21 inches (I haven't seen an official number yet). Thrall, Texas, located in Williamson County recorded 38.2 inches of rain in 24 hours ending on September 10, 1921. 31.8" of that fell in 12 hours and 23.4" of that fell in just six.  weather.gov/safety/flood-s. The associated flooding itself also wasn't unprecedented along the Guadalupe River. **Kerrville:** Peak crest of 23.40 feet • 3rd highest on record at that gauge • Record: 39.00 ft. on July 2, 1932 **Centerpoint:** 21.41 ft. • 2nd highest on record • Record: 24.27 ft. on October 16, 1978 **Comfort:** 34.76 ft. • 5th highest on record • Record: 42.3 ft. on July 1, 1869 • Three of the top five highest occurred prior to 1940 **Bergheim:** 49.70 ft. • Highest in record at that gauge **Spring Branch:** 29.33 ft. • 13th highest on record • Record: 53.00 ft. on August 3, 1869

On Sat, Jul 5, 2025 at 2:08 PM John Christy <climateman60@gmail.com> wrote:
This is more on-point. The catastrophic flooding was near Hunt TX (previous gage was at Spring Branch). Stream gage at Hunt has previous record at 12+ ft. in 2002 but only goes back to 1991. So 30ft at this gage was apparently outside of their recent experience. The discharge reached about 93,000 cfs this weekend, and a longer time series shows this is about 4 times what had been measured since the 1960s.

<https://waterdata.usgs.gov/monitoring-location/USGS-08165500/#dataTypeId=daily-00065-0&period=periodOfRecord>

<https://waterdata.usgs.gov/monitoring-location/USGS-08165500/#dataTypeId=daily-00060-0&period=periodOfRecord>

Though heavy rains are often seen somewhere in the Hill Country, there hadn't been one like this week's in this particular basin since at least the 1950s.

John C.

John Christy
Director, Earth System Science Center
Professor, Atmos and Earth Science
Alabama State Climatologist
The University of Alabama in Huntsville
climateman60@gmail.com

On Jul 5, 2025, at 3:19 PM, John Christy <climateman60@gmail.com> wrote:

Attached is the two-day total of CoCoRaHS network. These normally measure at 0700, so this is the 48-hour total ending at 0700 today.

Not many long terms stations. Kerrville 3NNE began in 1974. It shows a single day event of 11.60 on 2 August 1978 and two-day event 1-2 August 1978 of 15.80 inches. It also rained 0.78" on the 3rd.

Thus the numbers this weekend are tremendous but preceded - see report below, some totals of 30 inches in 1978.

Here's the USGS report.

<https://pubs.usgs.gov/of/1979/0682/report.pdf>

From the abstract:

FLOODS IN CENTRAL TEXAS AUGUST 1978

By
E. E. Schroeder, B. C. Massey
and Kidd M. Waddell

ABSTRACT

Catastrophic floods, which resulted in millions of dollars in property damages and the loss of 33 lives, occurred in Central Texas during August 1-4, 1978, as a result of intense rainfall produced by the remnants of tropical storm Amelia. Rainfall in excess of 30 inches was unofficially reported at several locations, while the highest 24-hour amount recorded by the National Weather Service was 29.05 inches at Albany in Shackelford

County.

I'll rummage around for some longer stats.

John C.

John Christy
Director, Earth System Science Center
Professor, Atmos and Earth Science
Alabama State Climatologist
The University of Alabama in Huntsville
climateman60@gmail.com

<TX_Kerrville_250704-05.png>

On Jul 5, 2025, at 2:36 PM, Steven Koonin <steven.koonin@gmail.com> wrote:

USHCN stations look pretty sparse in that part of Texas.

From: Judith Curry <curry.judith@gmail.com>

Sent: Saturday, July 5, 2025 2:41 PM

To: Steven Koonin <steven.koonin@gmail.com>

Cc: John Christy <climateman60@gmail.com>; Roy Spencer <roywspencer@hotmail.com>; Ross McKittrick <ross.mckittrick@gmail.com>; Travis Fisher <travis.scott.fisher@gmail.com>; Josh Loucks <loucksj14@gmail.com>; Seth Cohen <seth.cohen@hq.doe.gov>

Subject: Re: Texas flooding

Maybe a case study on this for CWG report?

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Our statements about NCA5 and precip extremes will surely be read by some with this context.

<image001.jpg>

As the World Warms, Extreme Rain Is
Becoming Even More Extreme (Gift Article)
[nytimes.com](https://www.nytimes.com)

Steven Koonin

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<~WRD0005.jpg>

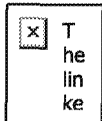
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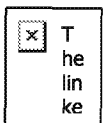
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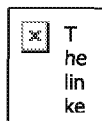
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From: John Christy <climateman60@gmail.com>
Sent: Tuesday, July 8, 2025 10:55 AM
To: Ross McKittrick
Cc: Judith Curry; Steve Koonin; Roy Spencer; Travis Fisher; Josh Loucks; Seth Cohen
Subject: Re: Texas flooding
Attachments: image.png; image.png; image.png; image.png; image.png; image.png

Ross

I noticed in NCA5 Fig. 26.11 that "More heavy rainfall events" is the dogmatic assumption which then motivates the vague generalities about action (that I believe a high-school science class could have formulated). I don't see anywhere a statement "From historical records, determine the probabilities of various levels of flooding, their frequencies and the subsequent risk they imply to infrastructure and lives. Then, address these known risks, which evidence indicates are not being worsened by changes in the background physical climate."

John C.

On Mon, Jul 7, 2025 at 4:01 PM Ross McKittrick <ross.mckittrick@gmail.com> wrote:

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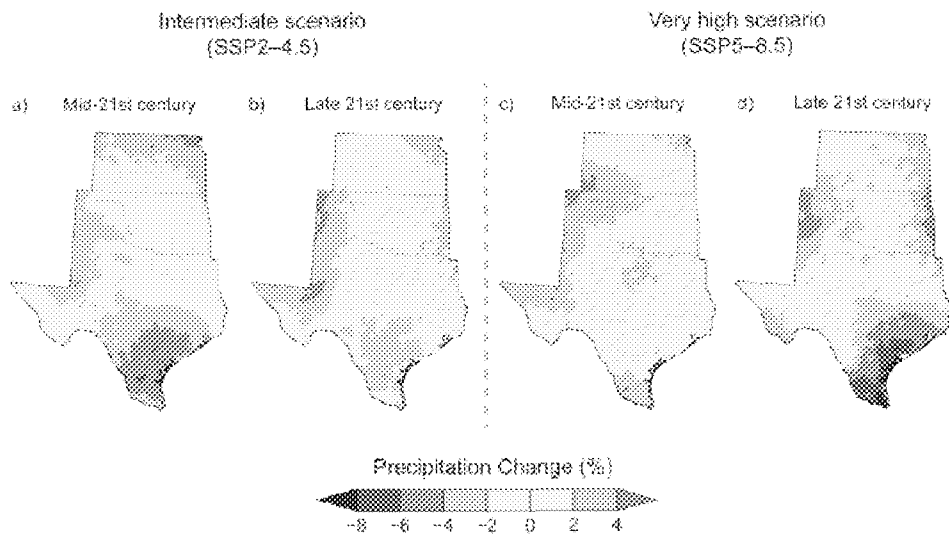
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Slightly drier conditions are projected for much of the western and southern portions of the region by the end of the century.

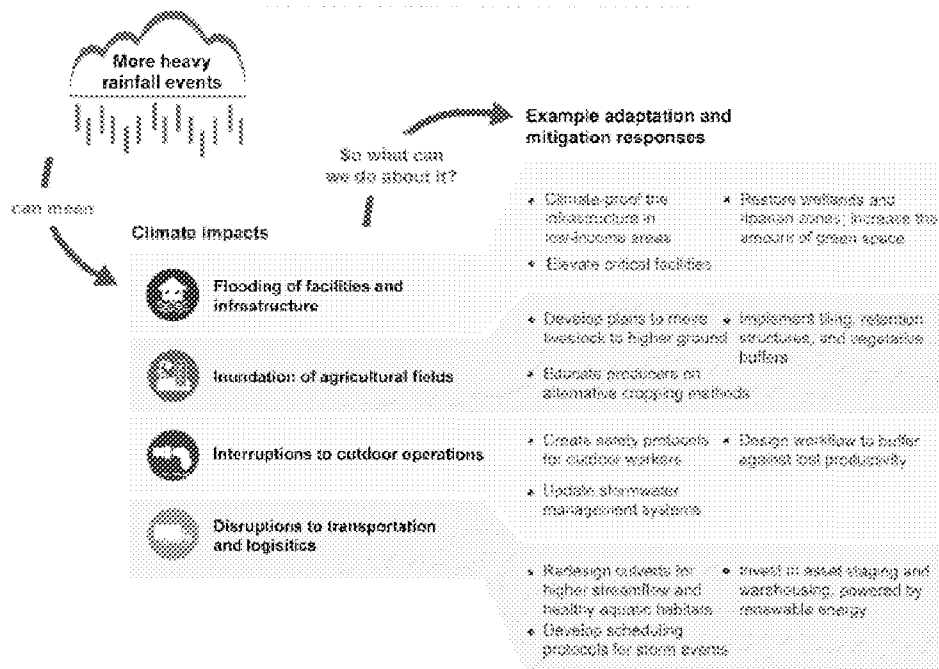
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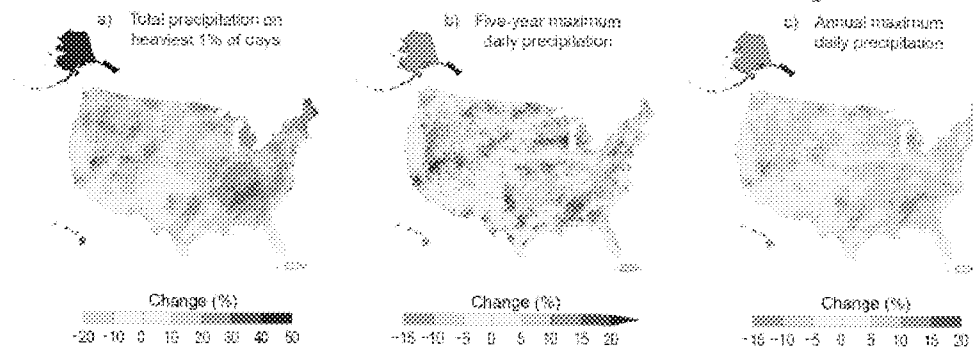
Rainfall is Becoming More Extreme

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Increases in the frequency and severity of heavy precipitation are expected at a global warming level of 2°C.

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E. E~ Schroeder, B. C. Massey
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<TX_Kerrville_250704-05.png>

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<steven.koonin@gmail.com> wrote:

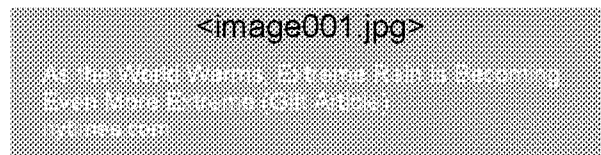
USHCN stations look pretty sparse in that part of Texas.

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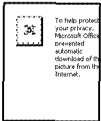
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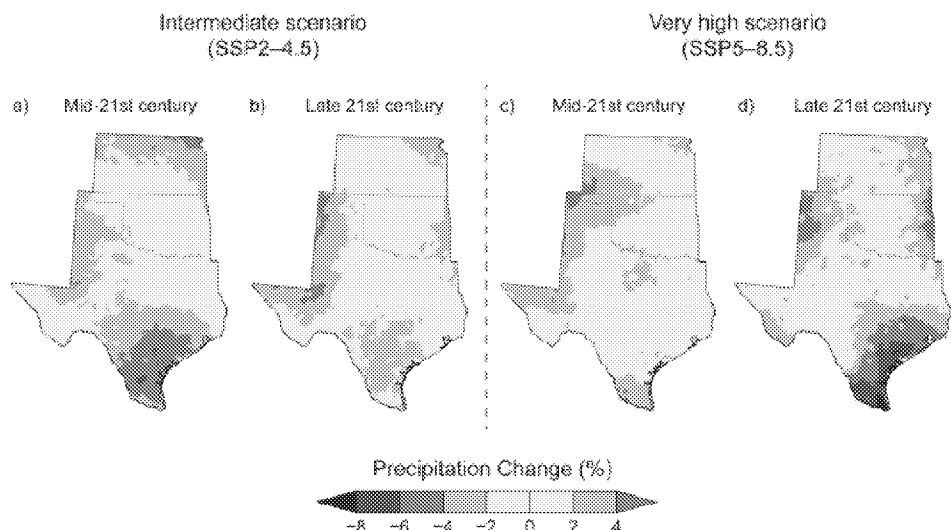
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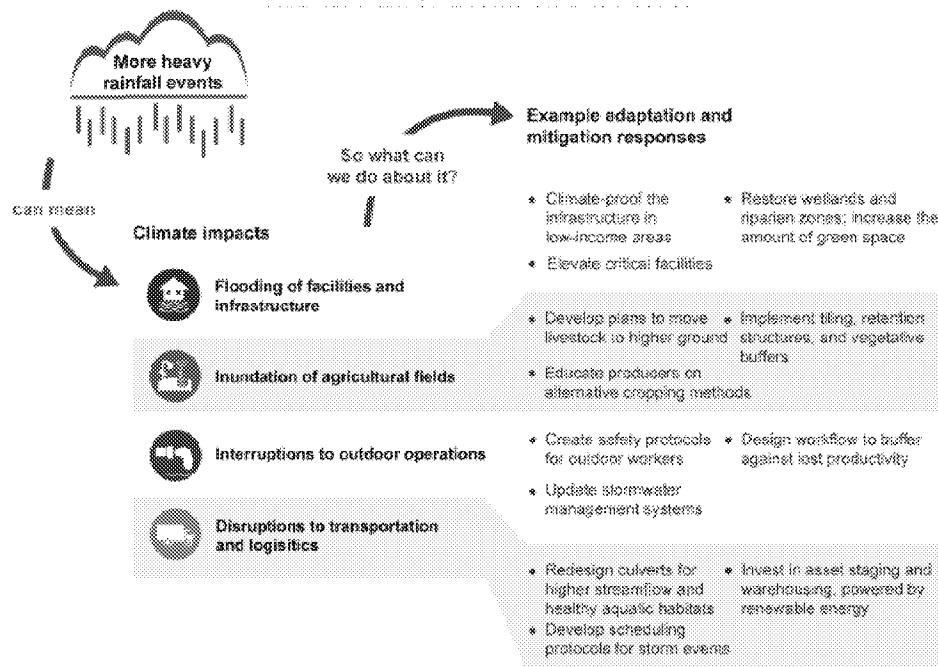
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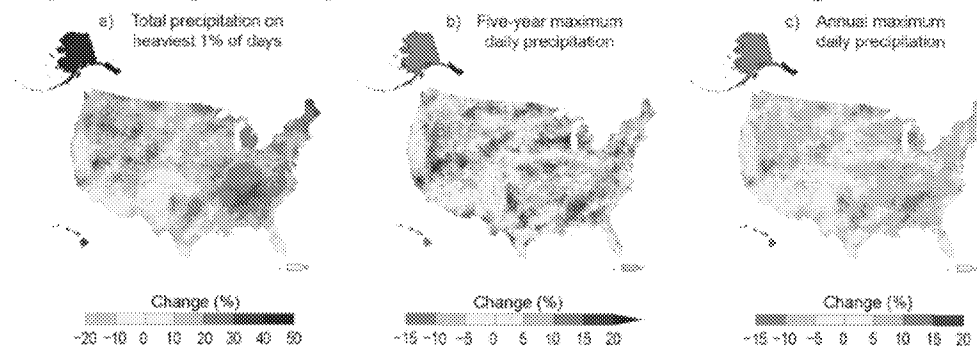
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<TX_Kerrville_250704-05.png>

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Sent: Saturday, July 5, 2025 2:41 PM

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Cc: John Christy <climateman60@gmail.com>; Roy Spencer <roywspencer@hotmail.com>; Ross McKittrick <ross.mckittrick@gmail.com>; Travis Fisher <travis.scott.fisher@gmail.com>; Josh Loucks <loucksj14@gmail.com>; Seth Cohen <seth.cohen@hq.doe.gov>

Subject: Re: Texas flooding

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<image001.jpg>

As the World Warms, Extreme Rain Is Becoming
Even More Extreme (Gift Article)
nytimes.com

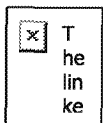
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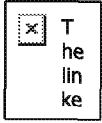
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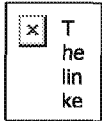
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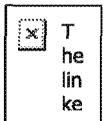
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Sent: Monday, July 7, 2025 4:50 PM
To: Ross McKittrick
Cc: John Christy; Steve Koonin; Roy Spencer; Travis Fisher; Josh Loucks; Seth Cohen
Subject: Re: Texas flooding

Ross, I like the material in this email (below) better than the text you sent. It focuses on deficiencies of NCA5, rather than what really went on with the floods (which seems a bit off topic for the NCA5 critique)

On Sun, Jul 6, 2025 at 7:51 AM Ross McKittrick <ross.mckittrick@gmail.com> wrote:

I looked at NCA5 from the perspective of someone who might have looked to it in recent times for guidance on dealing with flood hazards in Texas (ch 26). Here's the first bit of advice

Key Message 26.1

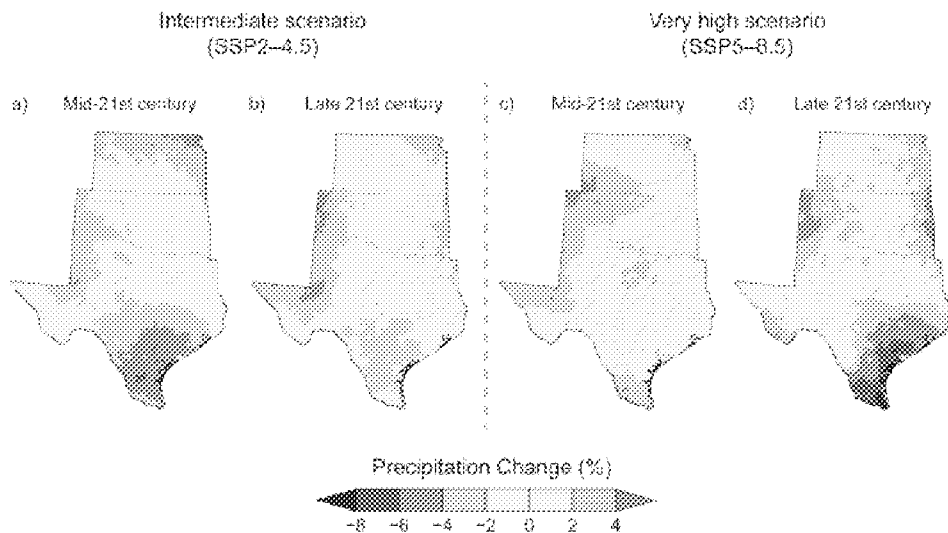
How We Live: Climate Change Is Degrading Lands, Waters, Culture, and Health

Climate change is beginning to alter how we live in the Southern Great Plains, putting us at risk from climate hazards that degrade our lands and waters, quality of life, health and well-being, and cultural interconnectedness (*high confidence*). Many climate hazards are expected to become more frequent, intense, or prolonged; to broaden in spatial extent; and to result in more people experiencing costly, deadly, or stressful climate-related conditions (*very likely, high confidence*). To address the growing risk, effective climate-resilient actions include implementing nature-based solutions; valuing Indigenous, traditional, and local knowledges; and infusing climate change solutions into community planning (*medium confidence*).

The chapter is mostly vague generalities about how everything is getting worse for everyone everywhere, and how nice it is that more wind and solar are being deployed.

Very little about precipitation risks. The projections are for less rainfall in South Texas:

Projected Change in Total Annual Precipitation



Slightly drier conditions are projected for much of the western and southern portions of the region by the end of the century.

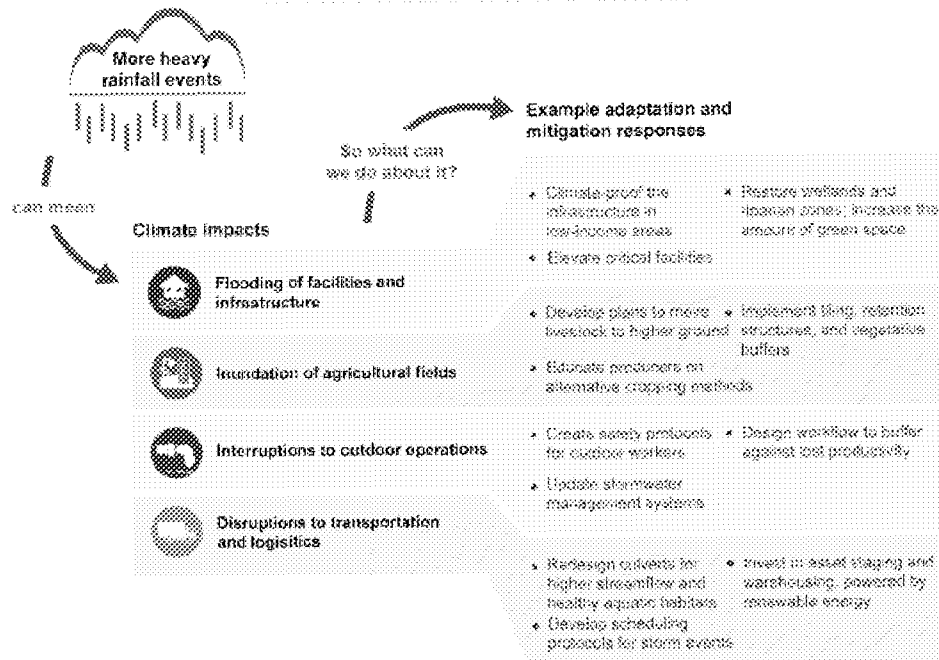
Figure 26.10. In the future, drier conditions threaten agriculture and water supplies in parts of the Southern Great Plains (brown), while more precipitation is projected near the northern and eastern boundaries of the region (green). Under an intermediate scenario (SSP2-4.5), total annual precipitation is projected to decrease by 4% or more (as compared to the 1991–2020 average) in southern Texas by mid-century (a), with smaller differences expected by century's end (b). Under a very high scenario (SSP5-8.5), annual precipitation is projected to decline slightly in western portions of the region by mid-century (c) and by 4% or more in southeast and far northwest Texas by the century's end (d). Figure credit: See figure metadata for contributors.

The first discussion of adapting to heavy rainfall hazards (p. 26-22) is this bit of scientific guidance:

Heavy rainfall and extreme temperatures cause sports teams to depend more on artificial or indoor environments, increasing participation costs and decreasing access to sports, especially for lower-income populations.¹³⁹ The Texas Rangers replaced their structurally sound stadium earlier than expected because extreme temperatures suppressed attendance.¹⁴⁰ The new stadium has a retractable roof for a climate-controlled environment. Sports events across all levels—from youth and interscholastic to collegiate and professional—have been halted or moved because of the unusual timing or intensity of storms (Figure 26.14, left), resulting in scheduling challenges, economic costs, and reduced social interactions.^{139,141} All people who enjoy the outdoors as part of their healthy lifestyle are expected to face more days with dangerous extreme heat (Figure 26.14, right).

Their adaptation advice is this (p. 26-19)

Resilience Actions to Address the Impacts of Heavier Rainfall Events on Businesses



Resilience actions can help businesses and industries reduce the negative consequences of more heavy rainfall events.

Figure 26.11. An increased number of heavy rainfall events affects business and industry across the Southern Great Plains through flooding of facilities and infrastructure, inundation of agricultural fields, interruptions to outdoor operations, and disruptions to transportation and logistics. The example adaptation and mitigation actions can increase resilience and reduce negative impacts. Figure credit: See figure metadata for contributors.

And no price is too high to pay for that level of insight.

The discussion of precipitation extremes in Ch 2 is so general they can point to it later and no matter what happens claim they warned about it:

Rainfall is Becoming More Extreme

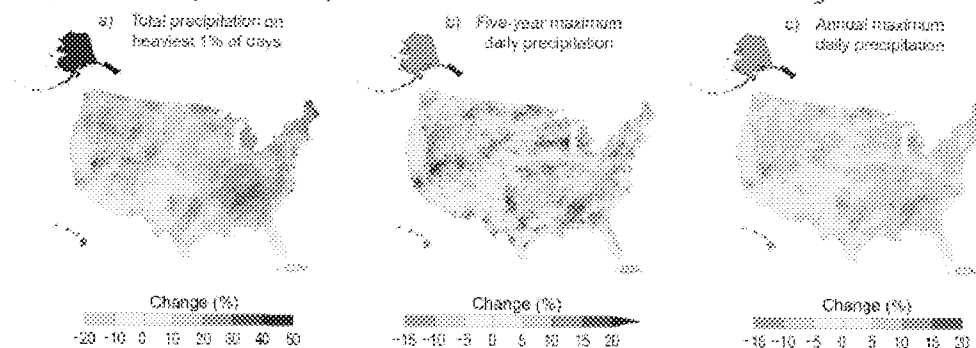
Since the 1950s, there has been an upward trend in heavy precipitation across the contiguous US (Figure 2.8).¹²⁸ This increase is driven largely by more frequent precipitation extremes, with relatively smaller changes in their intensity. The largest increase in the number of extreme precipitation days (defined as the top 1% of heaviest precipitation events) has occurred over the Northeast (an increase of around 60%) and Midwest (around 45%), along with increases of more than 10% in their annual and 5-year maximum amount (Figure 2.8). These changes have contributed to increases in river and stream flooding in these regions.^{123,124} The increase in frequency and intensity of precipitation extremes is evident across a broad range of event durations (from 1 to 30 days) and return intervals (1 to 20 years), particularly east of the Rocky Mountains.¹²⁶

There is robust evidence that human-caused warming has contributed to increases in the frequency and severity of the heaviest precipitation events across nearly 70% of the US.^{126,127} Paleoclimate records derived from tree-ring growth provide evidence that summer moisture has increased over the past century in parts of New England,¹²⁸ the central-eastern US,¹²⁹ and the northern Mississippi River valley.¹³⁰

2-18 | Climate Trends

But as we show, they lead with an untrue generalization and to the extent they get specific they don't mention the Southern Great Plains. The ch 2 projections (p. 2-25) are very ambiguous for Texas

Projected Changes to Precipitation Extremes at 2°C of Global Warming



Increases in the frequency and severity of heavy precipitation are expected at a global warming level of 2°C.

Figure 2.12. The maps show projected changes in three measures of extreme precipitation at a global warming level of 2°C: (a) total precipitation falling on the heaviest 1% of days, (b) daily maximum precipitation in a 5-year period, and (c) the annual heaviest daily precipitation amount. Changes are relative to the period 1991–2020. Based on LOCA2/STAR. Values for Alaska, Hawaii, and Puerto Rico are averages from STAR downscaling of 45, 16, and 21 stations, respectively. Data were not available for the US-Affiliated Pacific Islands and the US Virgin Islands. Figure credit: NOAA NCEI and CIRES NC.

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Thus the numbers this weekend are tremendous but preceded - see report below, some totals of 30 inches in 1978.

Here's the USGS report.

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From the abstract:

FLOODS IN CENTRAL TEXAS
AUGUST 1978

By

E. E~ Schroeder, B. C. Massey
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Catastrophic floods, which resulted in millions of dollars in property damages and the loss of 33 lives, occurred in Central Texas during August 1-4, 1978, as a result of intense rainfall produced by the remnants of tropical storm Amelia. Rainfall in excess of 30 inches was unofficially reported at several locations, while the highest 24-hour amount recorded by the National Weather Service was 29.05 inches at Albany in Shackelford County.

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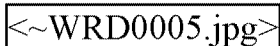
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Also - saw one report where NWS had up-staffed to 5 meteorologists on duty from the normal 2 for that night.

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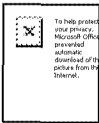
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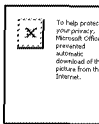
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Cliff Mass has a good rundown of accurate NWS forecasts of the event.

<https://cliffmass.blogspot.com/2025/07/the-texas-flooding-tragedy-could-it.html>

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Thus the numbers this weekend are tremendous but precedented - see report below, some totals of 30 inches in 1978.

Here's the USGS report.

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From the abstract:

FLOODS IN CENTRAL TEXAS
AUGUST 1978

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<TX_Kerrville_250704-05.png>

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To: Steven Koonin <steven.koonin@gmail.com>
Cc: John Christy <climateman60@gmail.com>; Roy
Spencer <roywspencer@hotmail.com>; Ross
McKittrick <ross.mckittrick@gmail.com>; Travis
Fisher <travis.scott.fisher@gmail.com>; Josh
Loucks <loucksj14@gmail.com>; Seth Cohen
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<image001.jpg>

As the world warms, extreme heat is becoming
even more extreme. (GIST Analyst)
NYTimes.com

Steven Koonin

--

<~WRD0005.jpg>

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looks like a good addition to our NCA5 report!

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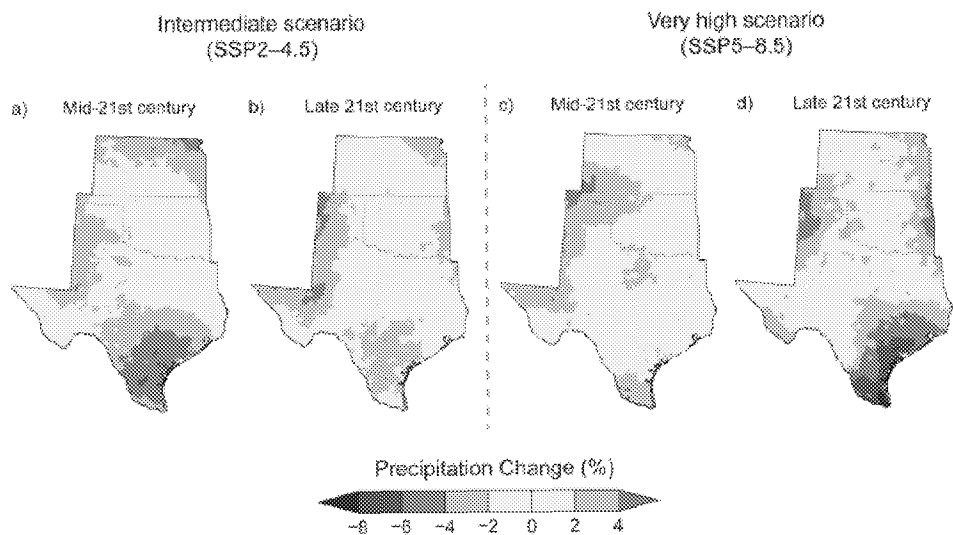
How We Live: Climate Change Is Degrading Lands, Waters, Culture, and Health

Climate change is beginning to alter how we live in the Southern Great Plains, putting us at risk from climate hazards that degrade our lands and waters, quality of life, health and well-being, and cultural interconnectedness (*high confidence*). Many climate hazards are expected to become more frequent, intense, or prolonged; to broaden in spatial extent; and to result in more people experiencing costly, deadly, or stressful climate-related conditions (*very likely, high confidence*). To address the growing risk, effective climate-resilient actions include implementing nature-based solutions; valuing Indigenous, traditional, and local knowledges; and infusing climate change solutions into community planning (*medium confidence*).

The chapter is mostly vague generalities about how everything is getting worse for everyone everywhere, and how nice it is that more wind and solar are being deployed.

Very little about precipitation risks. The projections are for less rainfall in South Texas:

Projected Change in Total Annual Precipitation



Slightly drier conditions are projected for much of the western and southern portions of the region by the end of the century.

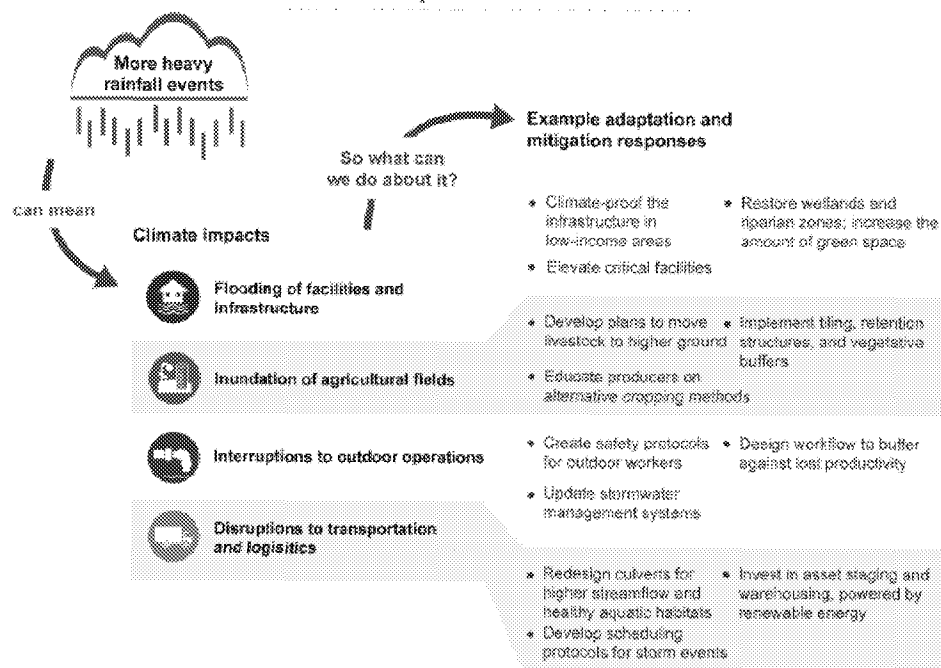
Figure 26.10. In the future, drier conditions threaten agriculture and water supplies in parts of the Southern Great Plains (brown), while more precipitation is projected near the northern and eastern boundaries of the region (green). Under an intermediate scenario (SSP2-4.5), total annual precipitation is projected to decrease by 4% or more (as compared to the 1991–2020 average) in southern Texas by midcentury (a), with smaller differences expected by century's end (b). Under a very high scenario (SSP5-8.5), annual precipitation is projected to decline slightly in western portions of the region by midcentury (c) and by 4% or more in southeast and far northwest Texas by the century's end (d). Figure credit: See figure metadata for contributors.

The first discussion of adapting to heavy rainfall hazards (p. 26-22) is this bit of scientific guidance:

Heavy rainfall and extreme temperatures cause sports teams to depend more on artificial or indoor environments, increasing participation costs and decreasing access to sports, especially for lower-income populations.¹³⁶ The Texas Rangers replaced their structurally sound stadium earlier than expected because extreme temperatures suppressed attendance.¹³⁵ The new stadium has a retractable roof for a climate-controlled environment. Sports events across all levels—from youth and interscholastic to collegiate and professional—have been halted or moved because of the unusual timing or intensity of storms (Figure 26.14, left), resulting in scheduling challenges, economic costs, and reduced social interactions.^{138,137} All people who enjoy the outdoors as part of their healthy lifestyle are expected to face more days with dangerous extreme heat (Figure 26.14, right).

Their adaptation advice is this (p. 26-19)

Resilience Actions to Address the Impacts of Heavier Rainfall Events on Businesses



Resilience actions can help businesses and industries reduce the negative consequences of more heavy rainfall events.

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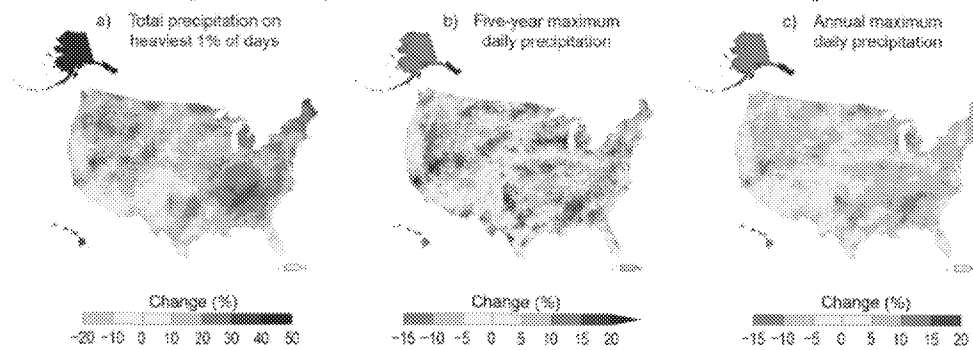
Rainfall is Becoming More Extreme

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Increases in the frequency and severity of heavy precipitation are expected at a global warming level of 2°C.

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<image001.jpg>

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nytimes.com

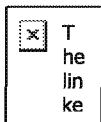
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<~WRD0005.jpg>

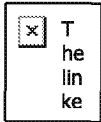
Judith Curry, President
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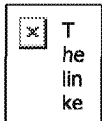
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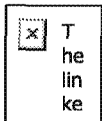
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To: Judith Curry
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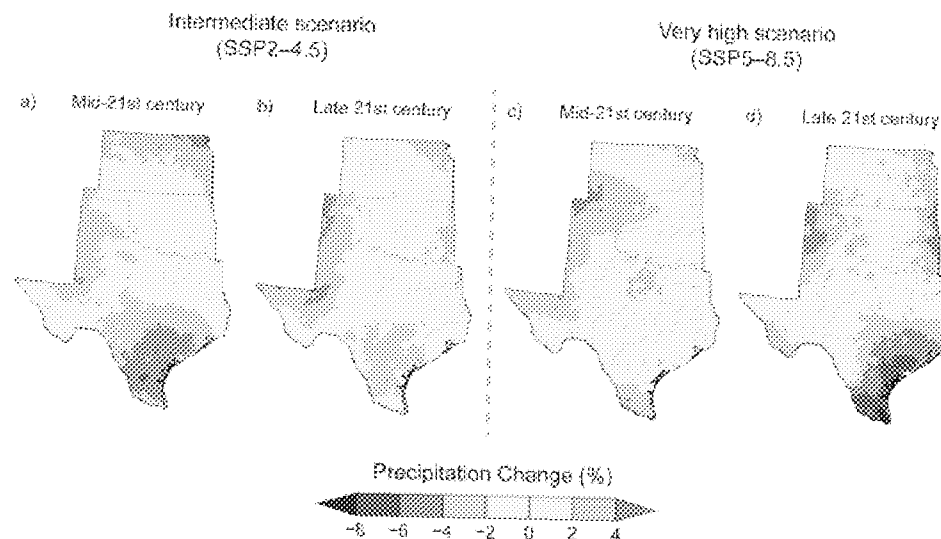
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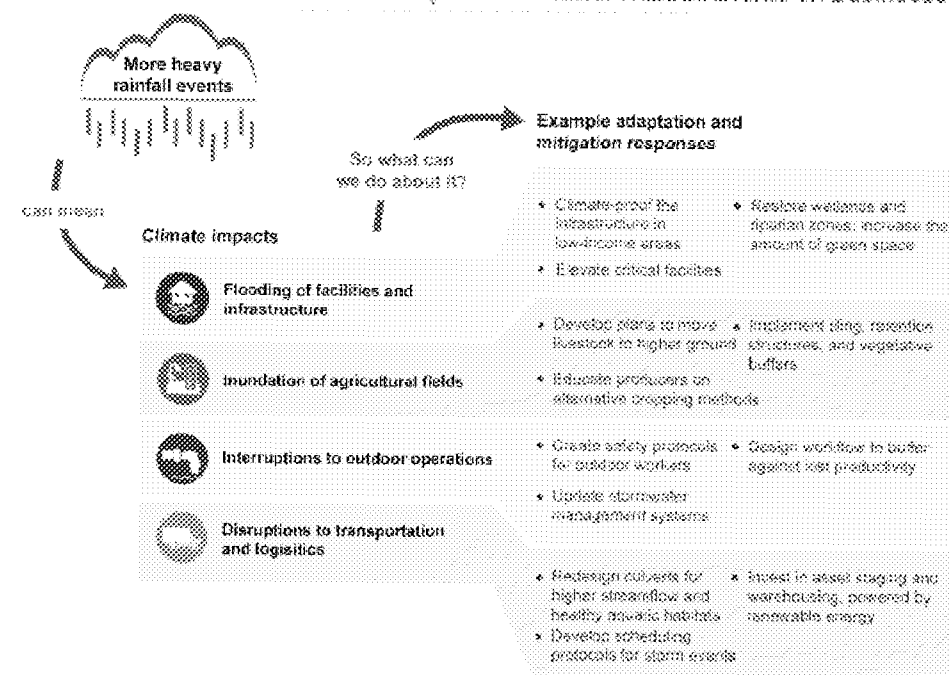
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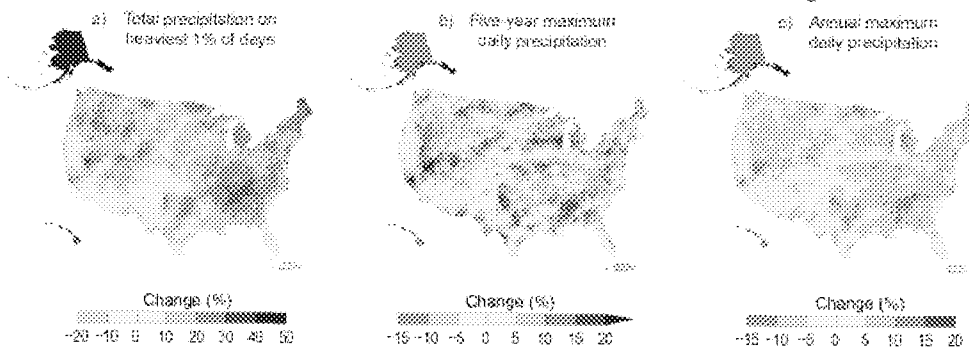
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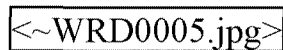
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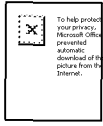
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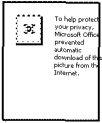
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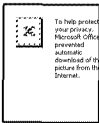
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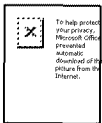
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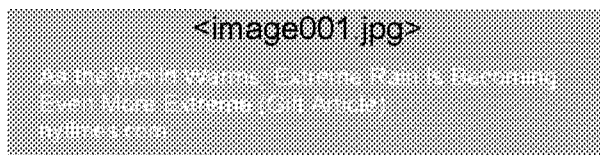
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To: Steven Koonin <steven.koonin@gmail.com>

Cc: John Christy <climateman60@gmail.com>; Roy Spencer <roywspencer@hotmail.com>; Ross McKittrick <ross.mckittrick@gmail.com>; Travis Fisher <travis.scott.fisher@gmail.com>; Josh Loucks <loucksj14@gmail.com>; Seth Cohen <seth.cohen@hq.doe.gov>

Subject: Re: Texas flooding

Maybe a case study on this for CWG report?

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Our statements about NCA5 and precip extremes will surely be read by some with this context.



Steven Koonin

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Judith Curry, President
CFAN - Climate Forecast Applications Network
Reno, NV USA
curry.judith@cfanclimate.com | +1.404.803.2012
<http://www.cfanclimate.net>

<~WRD0005.jpg>



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From: Roy Spencer [roywspencer@hotmail.com]
Sent: 7/5/2025 9:08:28 PM
To: John Christy [climateman60@gmail.com]; Steve Koonin [steven.koonin@gmail.com]
CC: Judith Curry [curry.judith@gmail.com]; Ross McKittrick [ross.mckittrick@gmail.com]; Travis Fisher [travis.scott.fisher@gmail.com]; Josh Loucks [loucksj14@gmail.com]; Seth Cohen [seth.cohen@hq.doe.gov]
Subject: RE: Texas flooding

Radar totals over 6 inches were pretty widespread. Over 10 inches were not uncommon. Did you watch the 37 minute video from 10 miles downstream of Kerrville where 480 crosses the normally dry river? 30+ ft rise in 30 minutes.

Sent from my Verizon, Samsung Galaxy smartphone

----- Original message -----

From: John Christy <climateman60@gmail.com>
Date: 7/5/25 3:20 PM (GMT-06:00)
To: Steve Koonin <steven.koonin@gmail.com>
Cc: Judith Curry <curry.judith@gmail.com>, Roy Spencer <roywspencer@hotmail.com>, Ross McKittrick <ross.mckittrick@gmail.com>, Travis Fisher <travis.scott.fisher@gmail.com>, Josh Loucks <loucksj14@gmail.com>, Seth Cohen <seth.cohen@hq.doe.gov>
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Thus the numbers this weekend are tremendous butprecedented - see report below, some totals of 30 inches in 1978.

Here's the USGS report.

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From the abstract:

FLOODS IN CENTRAL TEXAS
AUGUST 1978

By
E. E~ Schroeder, B. C. Massey
and Kidd M. Waddell

ABSTRACT

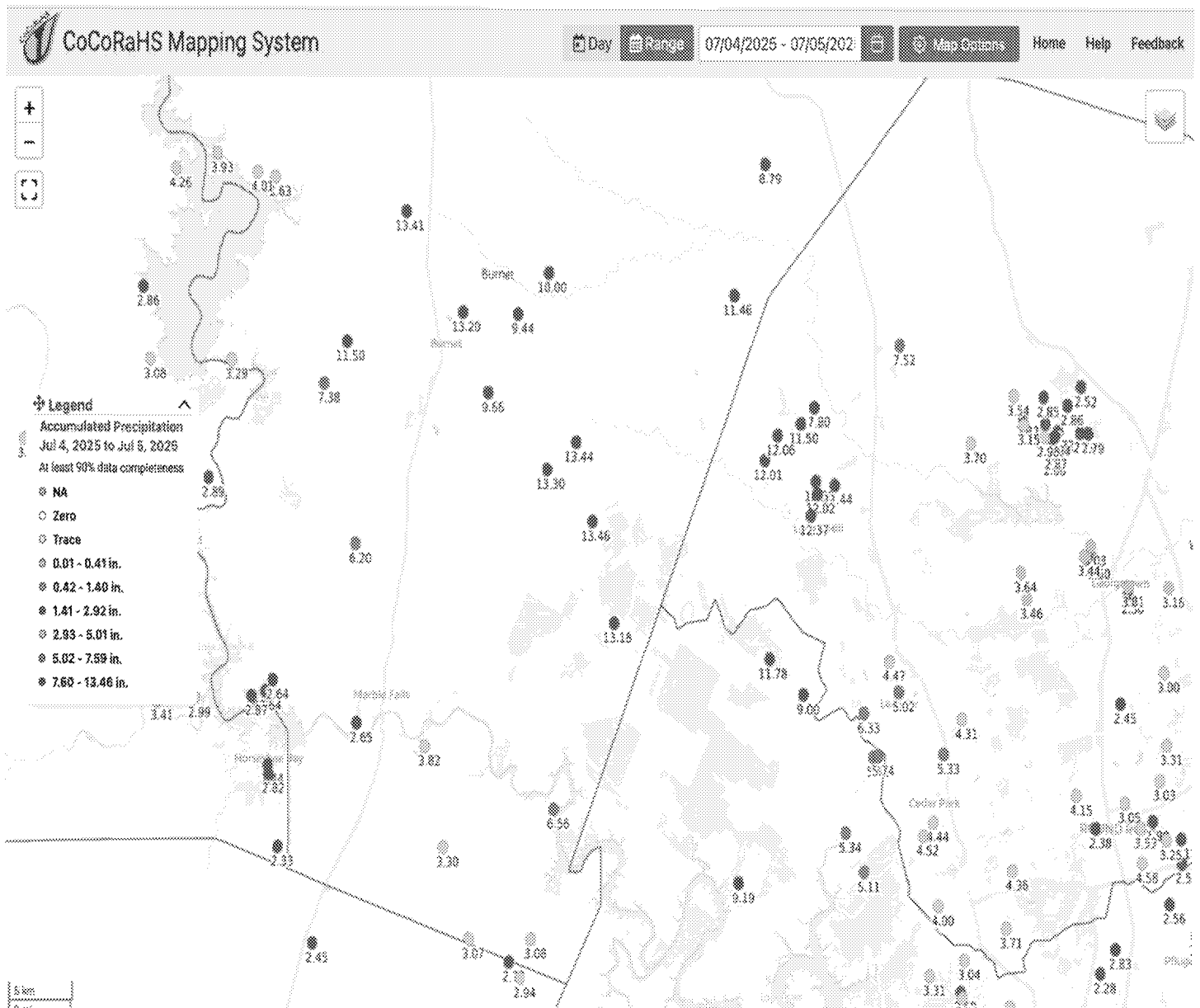
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reported at several locations, while the highest 24-hour amount recorded by the National Weather Service was 29.05 inches at Albany in Shackelford County.

I'll rummage around for some longer stats.

John C.

John Christy
Director, Earth System Science Center
Professor, Atmos and Earth Science
Alabama State Climatologist
The University of Alabama in Huntsville
climatemanager60@gmail.com



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<image001.jpg>

As the World Warms, Extreme Rain is Becoming
Even More Extreme (Gift Article)
[nytimes.com](https://www.nytimes.com)

Steven Koonin

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<~WRD0005.jpg>

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From: John Christy <climateman60@gmail.com>
Sent: Saturday, July 5, 2025 5:08 PM
To: Steve Koonin
Cc: Judith Curry; Roy Spencer; Ross McKittrick; Travis Fisher; Josh Loucks; Seth Cohen
Subject: Re: Texas flooding

This is more on-point. The catastrophic flooding was near Hunt TX (previous gage was at Spring Branch). Stream gage at Hunt has previous record at 12+ ft. in 2002 but only goes back to 1991. So 30ft at this gage was apparently outside of their recent experience. The discharge reached about 93,000 cfs this weekend, and a longer time series shows this is about 4 times what had been measured since the 1960s.

<https://waterdata.usgs.gov/monitoring-location/USGS-08165500/#dataTypeId=daily-00065-0&period=periodOfRecord>

<https://waterdata.usgs.gov/monitoring-location/USGS-08165500/#dataTypeId=daily-00060-0&period=periodOfRecord>

Though heavy rains are often seen somewhere in the Hill Country, there hadn't been one like this week's in this particular basin since at least the 1950s.

John C.

John Christy
Director, Earth System Science Center
Professor, Atmos and Earth Science
Alabama State Climatologist
The University of Alabama in Huntsville
climateman60@gmail.com

On Jul 5, 2025, at 3:19 PM, John Christy <climateman60@gmail.com> wrote:

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AUGUST 1978

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E. E. Schroeder, B. C. Massey
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<TX_Kerrville_250704-05.png>

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From: Roy Spencer <roywspencer@hotmail.com>
Sent: Saturday, July 5, 2025 5:05 PM
To: John Christy; Steve Koonin
Cc: Judith Curry; Ross McKittrick; Travis Fisher; Josh Loucks; Seth Cohen
Subject: RE: Texas flooding

The main danger appears to be Camp Mystic, with 750 residents for the holiday weekend, built in a flood plain. Safe in most years... until a major flood arrives. I'm sure the land was bought cheap... no locals were stupid enough to build their homes there.

Sent from my Verizon, Samsung Galaxy smartphone

----- Original message -----

From: John Christy <climateman60@gmail.com>
Date: 7/5/25 3:39 PM (GMT-06:00)
To: Steve Koonin <steven.koonin@gmail.com>
Cc: Judith Curry <curry.judith@gmail.com>, Roy Spencer <roywspencer@hotmail.com>, Ross McKittrick <ross.mckittrick@gmail.com>, Travis Fisher <travis.scott.fisher@gmail.com>, Josh Loucks <loucksj14@gmail.com>, Seth Cohen <seth.cohen@hq.doe.gov>
Subject: Re: Texas flooding

Something doesn't make sense here. The Guadalupe River at Spring Branch rose from 2ft to 30ft (per USGS stream gage) in this event. Previous floods peaked at 53.0 ft in 1869 and the flood of 1978 peaked at 45.25 ft. (Table 1 page 33). Why was a 30ft peak so hazardous to infrastructure and people?

<https://waterdata.usgs.gov/monitoring-location/USGS-08167500/#dataTypeId=continuous-00065-0&period=P7D>

and

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Then there is the issue of "disaster." Is it a disaster only if people are affected?

John C.

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Professor, Atmos and Earth Science
Alabama State Climatologist
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Steven Koonin

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curry.judith@cfanclimate.com | +1.404.803.2012
<http://www.cfanclimate.net>

From: John Christy <climateman60@gmail.com>
Sent: Saturday, July 5, 2025 4:40 PM
To: Steve Koonin
Cc: Judith Curry; Roy Spencer; Ross McKittrick; Travis Fisher; Josh Loucks; Seth Cohen
Subject: Re: Texas flooding

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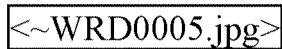
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Sent: 7/5/2025 8:19:52 PM
To: Steve Koonin [steven.koonin@gmail.com]
CC: Judith Curry [curry.judith@gmail.com]; Roy Spencer [roywspencer@hotmail.com]; Ross McKittrick [ross.mckittrick@gmail.com]; Travis Fisher [travis.scott.fisher@gmail.com]; Josh Loucks [loucksj14@gmail.com]; Seth Cohen [seth.cohen@hq.doe.gov]
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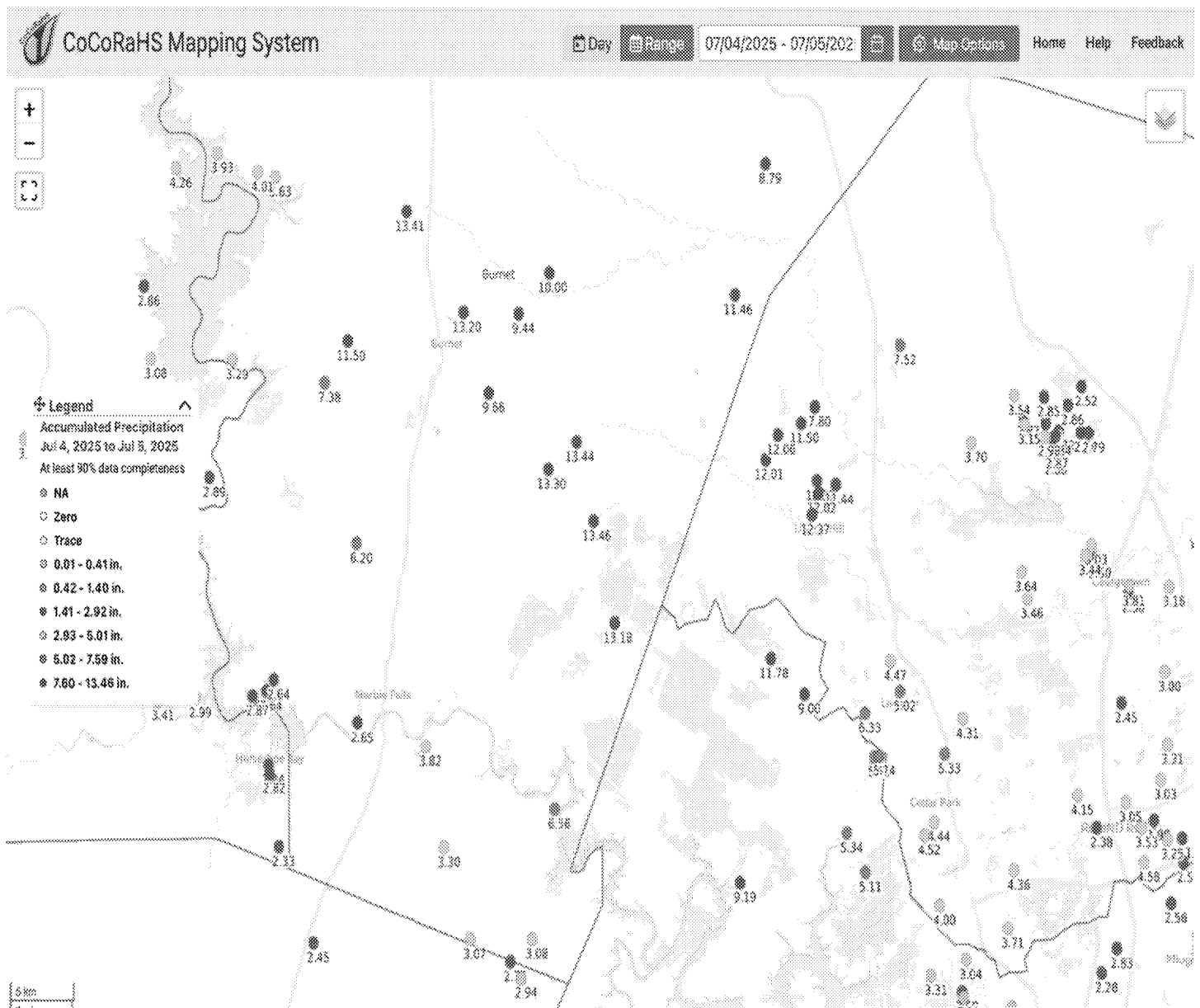
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As the World Warms, Extreme Rain is Becoming
Even More Extreme (Gilt Article)
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From: John Christy <climateman60@gmail.com>
Sent: Saturday, July 5, 2025 3:39 PM
To: Steve Koonin
Cc: Judith Curry; Roy Spencer; Ross McKittrick; Travis Fisher; Josh Loucks; Seth Cohen
Subject: Re: Texas flooding

I'll take a look around Kerrville. Many stations are not keyed in for the early years, and others which are not USHCN stations may have some good records. In preparing for a paper with Ross I've put together 22 stations so far for Kansas, but will shift for a bit to Kerrville and see what is available.

I like the new Executive summary as it mentions independent reviews (through the public comment) and other points that need to be up front.

John C.

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Sent: 7/5/2025 7:36:26 PM
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CC: 'John Christy' [climateman60@gmail.com]; 'Roy Spencer' [roywspencer@hotmail.com]; 'Ross McKittrick' [ross.mckittrick@gmail.com]; 'Travis Fisher' [travis.scott.fisher@gmail.com]; 'Josh Loucks' [loucksj14@gmail.com]; 'Seth Cohen' [seth.cohen@hq.doe.gov]
Subject: RE: Texas flooding
Attachments: ~WRD0005.jpg; image001.jpg

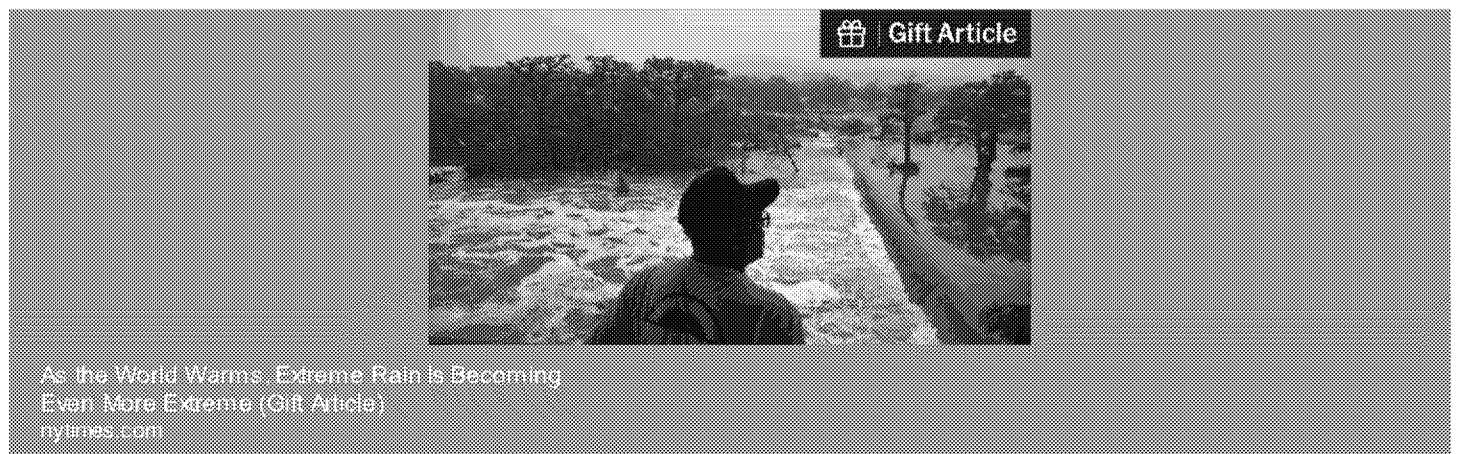
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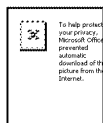
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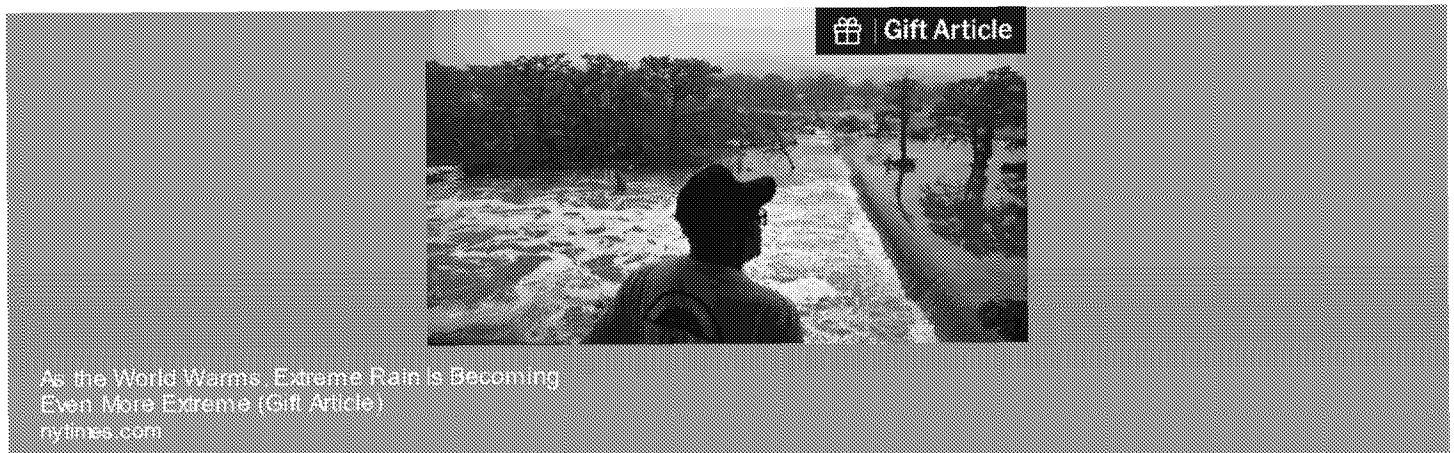
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Subject: Texas flooding

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Steven Koonin

From: Ross McKittrick <ross.mckitrick@gmail.com>
Sent: Thursday, July 3, 2025 10:04 AM
To: Steven Koonin
Cc: Judith Curry; John Christy; Roy W. Spencer; Travis Fisher; Josh Loucks; Seth Cohen
Subject: Re: Meeting edition

From the nature paper:

Subjective attribution of extreme weather was positively associated with policy support for five widely discussed climate policies. However, exposure to most types of extreme weather event did not predict policy support. Overall, these results suggest that subjective attribution could facilitate climate policy support.

Translation: People haven't yet been bamboozled into thinking carbon taxes will prevent bad weather but with enough propaganda maybe we can change that.

On Wed, Jul 2, 2025 at 3:28 PM Steven Koonin <steven.koonin@gmail.com> wrote:
Subjective attribution = fairy tale

Steven E. Koonin

On Jul 2, 2025, at 15:17, Judith Curry <curry.judith@gmail.com> wrote:

new paper says the quiet part out loud

<https://www.nature.com/articles/s41558-025-02372-4>

On Wed, Jul 2, 2025 at 10:37 AM Steven Koonin <steven.koonin@gmail.com> wrote:
It's name plate capacity.

Typical capacity factors (actual generation vs name plate) are about 20% for solar and 33% for onshore wind, compared to 92% for nuclear and 50% for gas turbines.

Steven Koonin

On Jul 2, 2025, at 13:16, John Christy <climateman60@gmail.com> wrote:

All

In this paragraph quoted from NCA5

"Recent growth in the capacities of wind, solar, and battery storage technologies is supported by rapidly falling costs of zero- and low-carbon energy technologies, which can support even deeper emissions reductions. For example, wind and solar energy costs dropped 70% and 90%, respectively, over the last decade, while 80% of new generation capacity in 2020 came from renewable sources. "

does "new generation capacity" mean name-plate capacity or actual generation of power compared with all new generation of power in 2020?

John C.

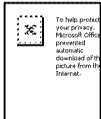
On Tue, Jul 1, 2025 at 10:55 AM Ross McKittrick <ross.mckittrick@gmail.com> wrote:

I've taken Steve's version and done a bit of tidying to make it easier for us to go through in our Thursday meeting.

- minor edits have been accepted to remove the strikethrough wording
- Where text is currently disputed it is bracketed  before and after.
- A few minor edits of my own in green text.

Ross

--



Judith Curry, President
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From: Ross McKittrick <ross.mckittrick@gmail.com>
Sent: Thursday, July 3, 2025 9:51 AM
To: John Christy
Cc: Steven Koonin; Judith Curry; Roy W. Spencer; Travis Fisher; Josh Loucks; Seth Cohen
Subject: Re: Meeting edition

The EIA will have that info.

On Thu, Jul 3, 2025 at 8:28 AM John Christy <climateman60@gmail.com> wrote:
Steve

Is there any way to calculate the actual contribution of new wind and solar to the total new generation that was used? So, if renewables accounted for 80% of new “capacity” did they really only contribute about say 30% of the actual increase in demand?

John C.
Sent from my iPhone

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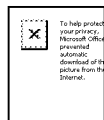
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Sent: 7/3/2025 1:30:12 PM
To: Steven Koonin [steven.koonin@gmail.com]
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Subject: Re: Meeting edition

Now you guys are venturing into my area of expertise. I can help with this!

Add it to the list of things to be discussed this afternoon.

On Thu, Jul 3, 2025 at 9:20 AM Steven Koonin <steven.koonin@gmail.com> wrote:

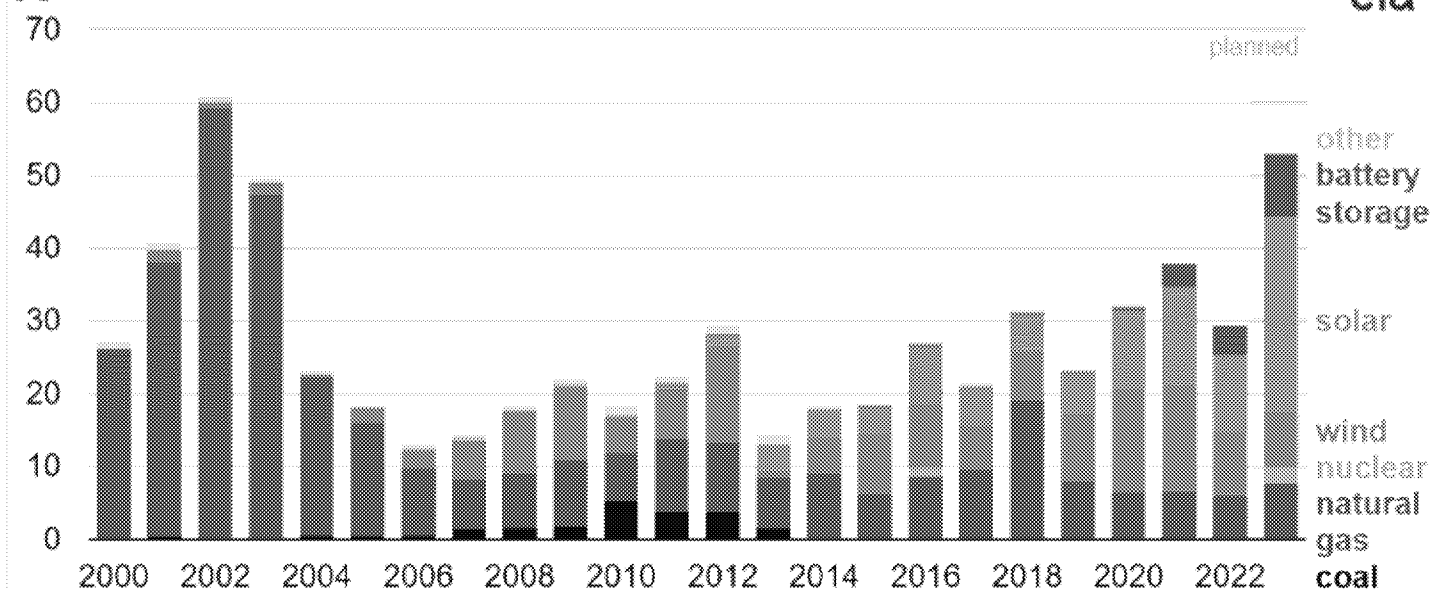
EIA is your friend here; see <https://www.eia.gov/electricity/data.php>.

Some specific charts:

Capacity additions by source:

Annual U.S. electric-generating capacity additions (2000–2023)

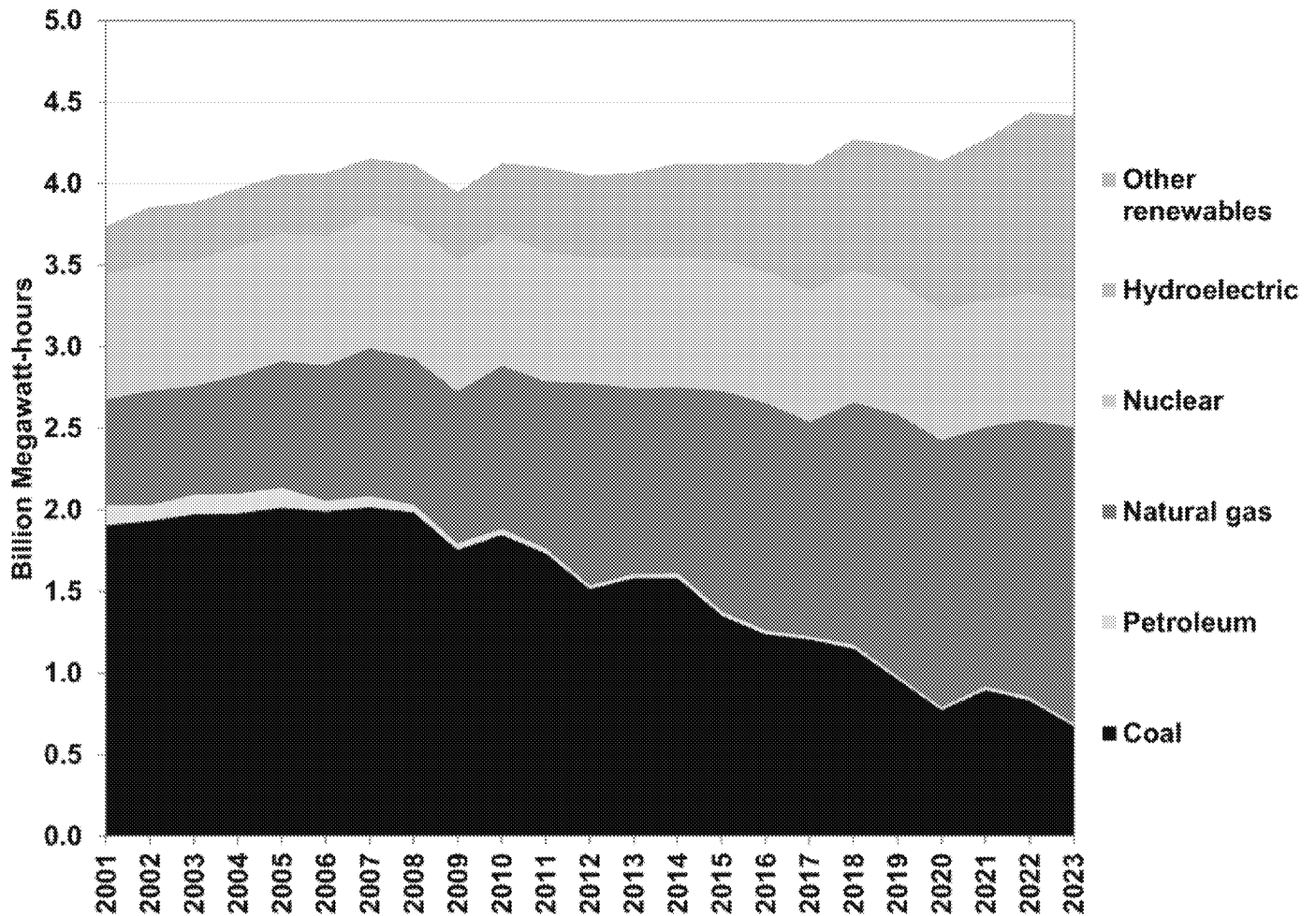
gigawatts



Data source: U.S. Energy Information Administration, Preliminary Monthly Electric Generator Inventory, January 2023

And generation by source:

Net Generation of Electricity for All Sectors by Source, 2001–2023



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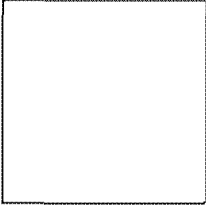
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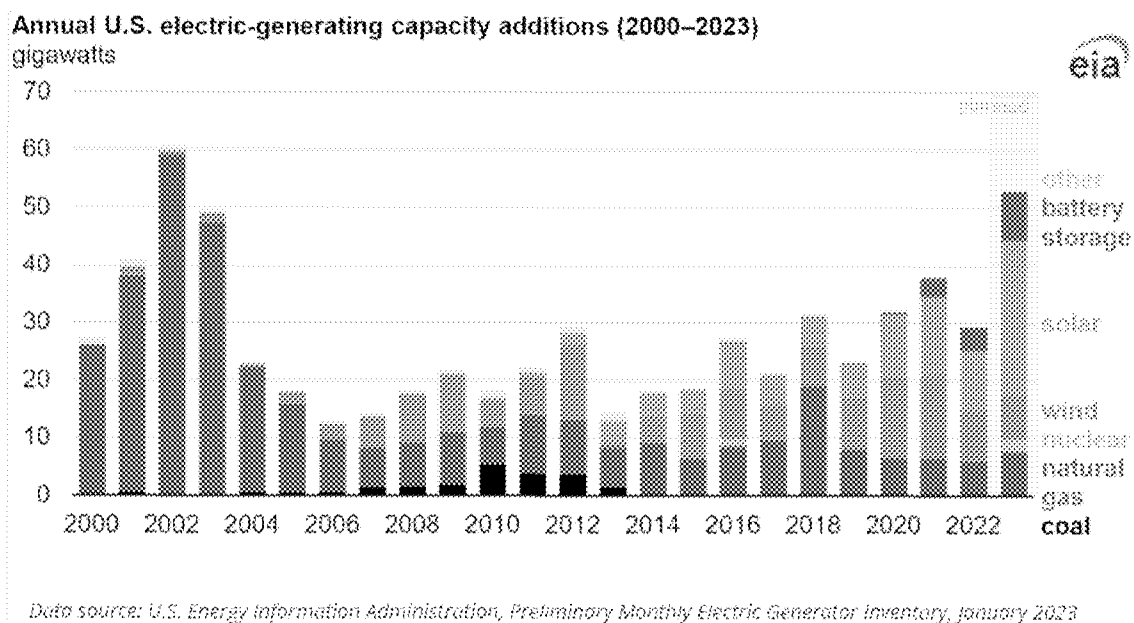
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Sent: Thursday, July 3, 2025 9:21 AM
To: 'John Christy'
Cc: 'Judith Curry'; 'Ross McKittrick'; 'Roy W. Spencer'; 'Travis Fisher'; 'Josh Loucks'; 'Seth Cohen'
Subject: RE: Meeting edition
Attachments: ~WRD0003.jpg; image001.png; image002.png

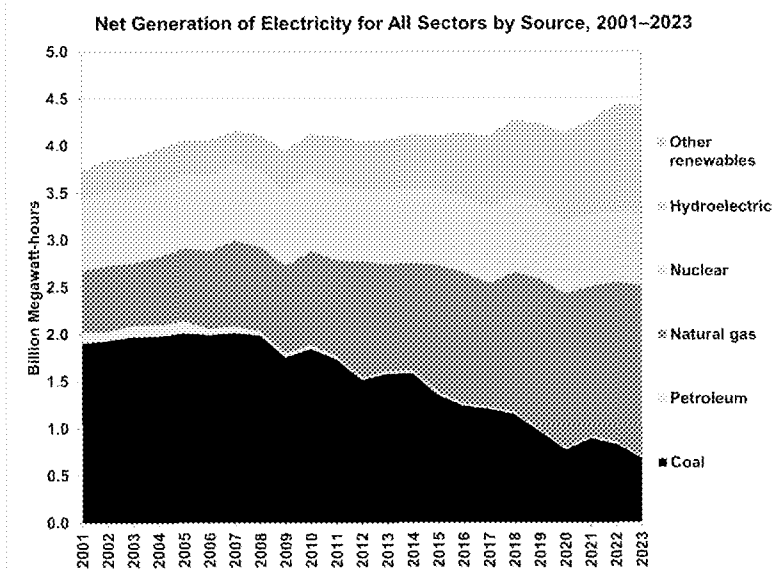
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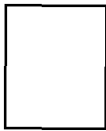
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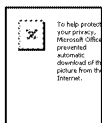
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To help protect
your privacy,
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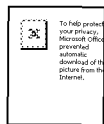
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Attachments: 01.NCA5.ReviewJuly3meeting.docx

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Review of the Fifth National Climate Assessment

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EXECUTIVE SUMMARY

This report critically evaluates the Fifth National Climate Assessment (NCA5), finding it an inadequate basis for climate and energy policies. A detailed review of the foundational chapters on climate science raises several key concerns:

Scientific Integrity

- An advocacy tone, particularly in the Overview chapter, that is inconsistent with scientific objectivity
- Endemic overconfidence when stating conclusions, including inflated certainty levels and overstatement of findings from underlying sources

Flawed methodology

- Use of short time periods for trend analyses; more generally lack of a consistent rule for choosing time scales
- Overemphasis on extreme scenarios for future emissions and sea level rise
- Inadequate traceable accounts to support key conclusions

Deficient Review Process

- A review by the National Academy of Sciences, Engineering, and Medicine (NASEM) failed to challenge some fundamental flaws in NCA5
- The NCA5 authors failed to adopt some improvements recommended by NASEM

The report shows NCA5 to be a biased and incomplete picture of climate science that skews toward excessive climate risk. Consequently, NCA5 should not be used as basis for climate and energy policies.

1 INTRODUCTION

1.1 About this Report

This report responds to a request from Office of Science and Technology Policy (OSTP) Director Michael Kratsios (reproduced in Appendix 1) that we assess the suitability of the Fifth National Climate Assessment (NCA5 2023) for informing climate and energy policies.

To conduct this assessment we reviewed NCA5 itself, the National Academies of Science, Engineering and Medicine (NASEM) review of the Third Order NCA5 Draft, and the USGCRP responses to that review. We have drawn upon our long experience working on advisory reports, including for the NASEM, the Intergovernmental Panel on Climate Change (IPCC) and other organizations, as writers, reviewers and study leaders.

We find that NCA5 should not be relied on for policy making as it is an incomplete and misleading picture of our understanding of the changing climate and the risks it poses to the nation. NCA5 was selective and incomplete in its survey of climate science. Further, we have reviewed recent scientific developments in a separate report to Energy Secretary Wright (Climate Working Group 2025, herein denoted “CWG25”). The overall effect of the biases and omissions of NCA5 is an excessively dire picture of climate risk.

To support our finding, the following sections of this chapter provide some background on the National Climate Assessments and the standards by which we have assessed NCA5. Chapters 2 through 7 detail important ways in which NCA5 fails to meet those standards. Finally, Chapter 8 summarizes our evaluation of NCA5 and makes recommendations for NCA6.

1.2 About the National Climate Assessments

The U.S. Global Change Research Program (USGCRP) was established by Presidential Initiative in 1989 and mandated by Congress in the Global Change Research Act (GCRA) of 1990 to develop and coordinate “a comprehensive and integrated United States research program which will assist the Nation and the world to understand, assess, predict, and respond to human-induced and natural processes of global change.”

The National Climate Assessment (NCA) Reports evolved from the GCRA requirement to:

Prepare and submit to the President and the Congress an assessment which (1) integrates, evaluates, and interprets the findings of the Program and discusses the scientific uncertainties associated with such findings; (2) analyzes the effects of global change on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biological diversity; and (3) analyzes current trends in global change, both human-induced and natural, and projects major trends for the subsequent 25 to 100 years.

The five NCA Reports to date have interpreted this mandate in different ways:

- NCA1 (2000) was a multidisciplinary effort to study and portray in regional detail the potential effects of human-induced global warming on the United States.

- NCA2 (2009) was a relatively short report that not only focused on the potential consequences of climate change but also sought to identify potential adaptation measures and identify the highest priorities for future research.
- NCA3 (2014) was an expanded effort that continued along the lines of NCA2, and was distinguished by a comprehensive review process, including a review by the National Academy of Sciences. NCA3 introduced a traceability analysis for each key finding, including a description of uncertainties.
- NCA4 (2017/2018) was a further expanded effort that was published in two volumes: I Climate Science Special Report (CSSR), and II Impacts, Risk, and Adaptation in the United States. This was the first NCA report to devote significant effort to assessing climate science.
- NCA5 (2023) returned to a single volume format, reducing discussion of climate science to a cursory two chapters, with continuing focus on regional and sectoral impacts of climate change. NCA5 expanded its remit to topics that are arguably outside the purview of the USGCRP, focusing on “Climate Action” and policy recommendations with a social justice emphasis.

These successive interpretations of the NCA are poorly aligned with the GCRA’s statutory requirements. Only NCA4 gives serious consideration to climate science, which receives the great majority of USGCRP funding, and even then NCA4 misrepresents some important points. Natural climate variability is essentially dismissed as unimportant in NCA4 and barely mentioned in NCA5 in most contexts, despite the mandate to include both human-caused and natural climate change. Most significantly, NCA5 has redirected the focus away from climate science and even the hazard elements of impacts, towards evaluation of societal vulnerabilities and advocacy for particular policy options, especially wind and solar power. The cover image for the NCA5 Report is the installation of a solar panel.

1.3 Standards for Assessing NCA Products

Beyond the statutory requirements stated above, another pertinent standard is President Trump’s executive order of May 23, 2025, Restoring Gold Standard Science. It enumerates some of the characteristics of good science, namely that it should be:

- i. reproducible;
- ii. transparent;
- iii. communicative of error and uncertainty;
- iv. collaborative and interdisciplinary;
- v. skeptical of its findings and assumptions;
- vi. structured for falsifiability of hypotheses;
- vii. subject to unbiased peer review;
- viii. accepting of negative results as positive outcomes; and
- ix. without conflicts of interest.

Although these should be self-evident to those trained in science, it is surprising that some scientists have found them controversial (Dellawalla et al. 2025).

====debated text:

When science is assessed for the purpose of climate policymaking there are further requirements to bear in mind. Good climate and energy policies should balance the risks and benefits of a changing

climate against the world's growing demand for reliable and affordable energy. To strike that balance, policymakers must understand at least two complex and nuanced topics: the certainties and uncertainties of climate science and the technoeconomic realities of energy systems. Experts in those subjects have a responsibility to communicate their understanding to non-experts clearly, completely, and without bias.

Expertise in energy systems resides largely in the private sector, where it is essential to providing the reliable and affordable energy services that are the lifeblood of society. Understanding is therefore continually refined and tested by operational demands and the discipline of the marketplace. In contrast, climate science expertise is found largely in the non-profit realm of universities and government laboratories and so has a more academic character, with greater uncertainties and hence need for expert judgement.

=====

For those reasons assessments of climate science that will be influential for policy making must include statements about the strength of knowledge. The IPCC's approach to assessing strength of knowledge is based on judgment of the available evidence and agreement among experts. But there are more sophisticated knowledge characterizations for risk management (Aven 2017). Here are its elements:

- The degree to which the assumptions made are reasonable/realistic based on background knowledge
- The degree to which data/information exists and are reliable and relevant
- The degree to which there is disagreement among experts (including those from different environments or academic fields)
- The degree to which the phenomena involved are understood and accurate models exist
- The degree to which the knowledge has been thoroughly examined with respect to unknown knowns

1.4 When Peer Review Fails

Peer review of reports like IPCC and NCA products is not a silver bullet that guarantees quality. The peer review process for these reports differs in some important respects from traditional peer review in academic journals. First, during the open review phases of early NCA drafts reviewers are volunteers who self-select what parts of the report to read, whereas the editors of academic journals recruit reviewers with relevant expertise and assign them to specific papers. As a result, there is no guarantee at that stage that any particular section of an NCA report was reviewed by anyone, let alone by someone with relevant expertise and a perspective that differs from the authors. In fact, many potential reviewers have given up over the years because their input has systematically been ignored. The introduction of a NASEM review stage is at best a partial remedy for this. However, NCA authors have near complete authority whether to accept or reject review comments. By contrast, the Editor of an academic journal mandates the author to respond, and the reviewer and Editor assess its adequacy. Finally, the work of an NCA chapter author team is guaranteed to be published, whereas academic journals routinely reject papers that do not pass review.

These points are important to bear in mind because some readers might dismiss any criticism of NCA products out of hand on the grounds that they were "peer reviewed". But the test of a report is whether its contents are a valid representation of the available evidence. Here we give an example in which NCA4 gave prominence to a figure that completely misrepresented the underlying data and which evaded peer review to do so. Further details can be found in Koonin (2024).

NCA4's Part I says (prominently and with *Very High Confidence*) on Page 19 of the Executive Summary:

There have been marked changes in temperature extremes across the contiguous United States. The number of high temperature records set in the past two decades far exceeds the number of low temperature records.

and offers this figure in support:

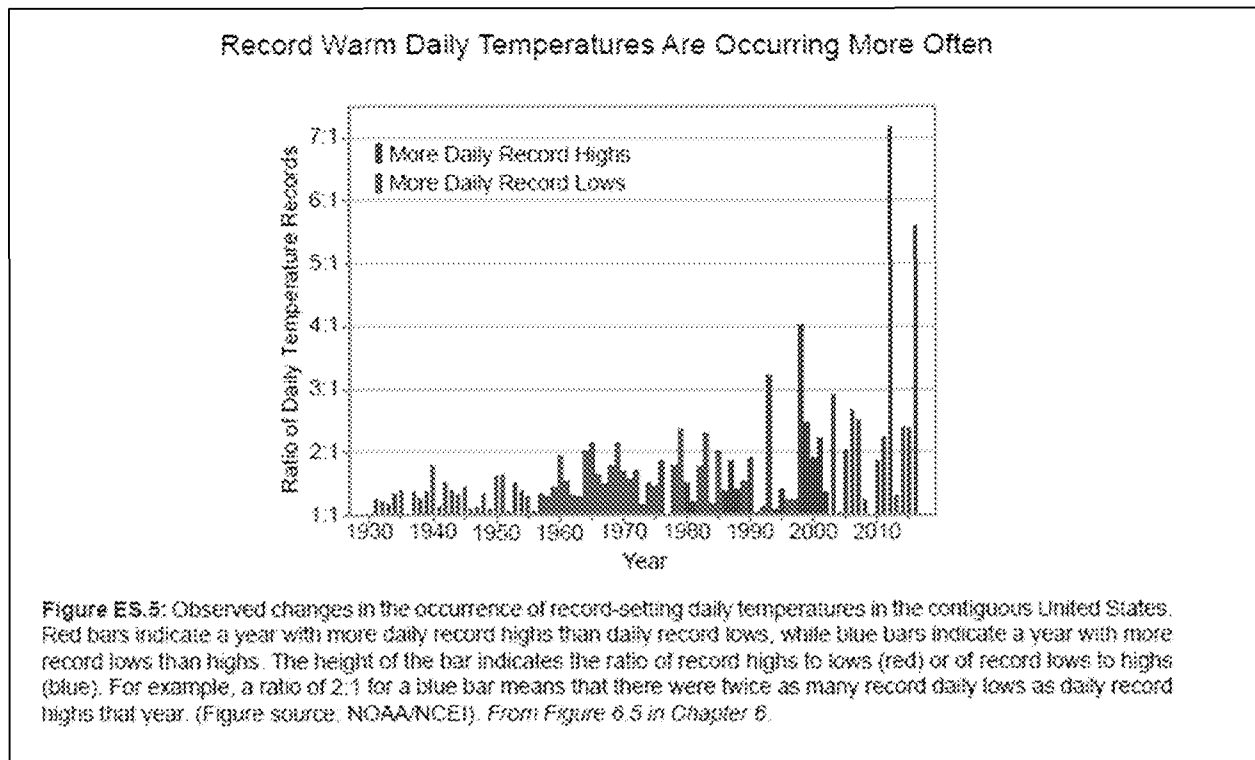


FIGURE 1: Reproduction of Figure ES.5 from NCA4

The figure appears to validate the claim that record warm daily temperatures are occurring more often. But the underlying data do not. Rather, they show that extreme heat in the U.S. peaked in the 1920s and 1930s and declined thereafter, as supported by Figure 6.4 deep within the CSSR itself (reproduced in Section 4.2 of this report).

Figure ES.5 does not even show what its title implies, as it displays not simple counts of cold and warm extreme events, but rather ratios of the two counts. ===== Both types of extremes declined over the sample interval, but cold events declined more than warm events, so the ratio of warm extremes to cold extremes increased. By graphing the ratio instead of counts, NCA4 created a visual impression opposite to what is in the data. =====

Figure 6.3.3 of CWG25 (reproduced below) shows the results of a proper analysis and presentation of the data – defining each record as the singular extreme in the sample interval, displaying numbers of warm and cold records separately, and beginning the analysis in 1899 rather than 1930. It makes evident the exceptional heat of the 1920s and especially the 1930s, peaking in 1936. (The increased

heat of the past five years is too brief to be deemed climatically significant and, in any event, occurred after the CSSR was published in 2017.) The frequency of cold records has declined, especially over the last quarter of the period in which only 13 percent of the extreme cold events were measured. In contrast, 25 percent of the heat records were achieved in the last quarter, which is consistent with statistical expectations. As a result, the ratio of hot to cold extremes shown in Figure ES.5 of the CSSR explodes in recent decades. The overall reduction in numbers of both cold and hot extremes over the past century indicates a climate *less* prone to extremes, in sharp contrast to the message of NCA4 Figure ES.5.

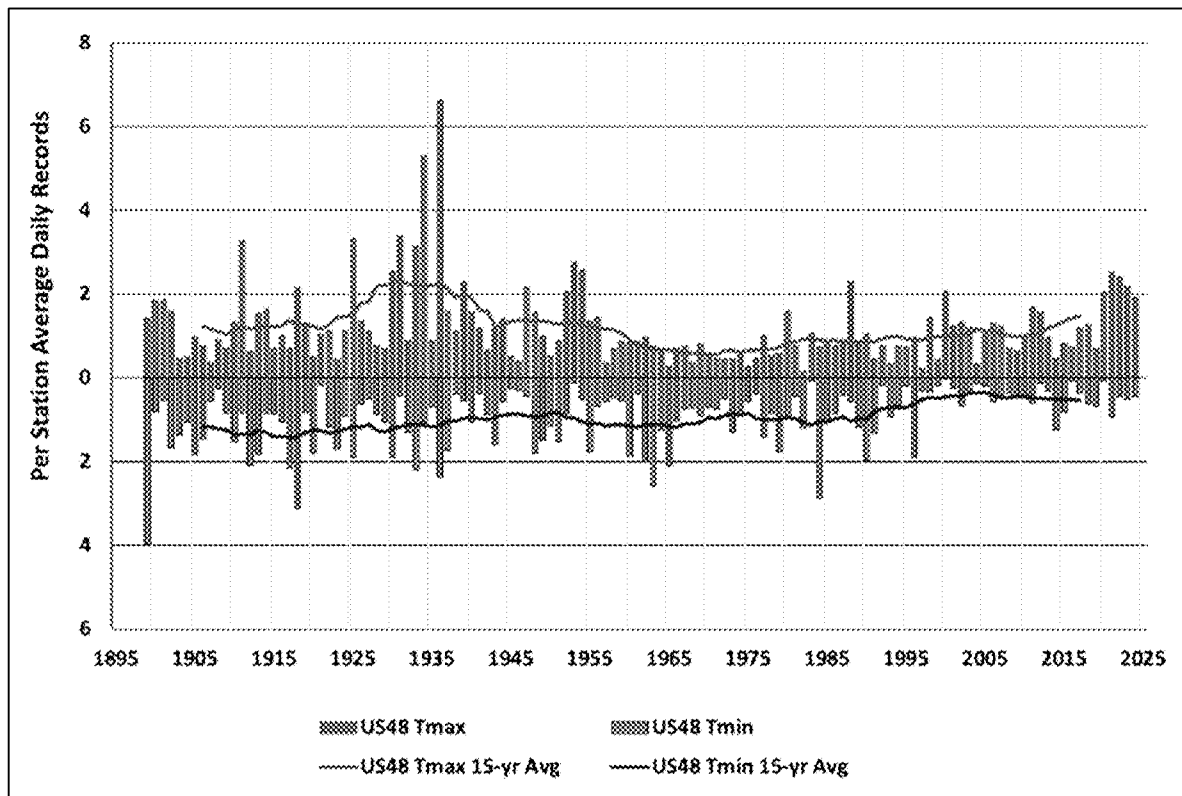


FIGURE 2: Number of daily record High (red) and Low (blue) temperatures for warm and cold seasons in the CONUS. The lines represent the 15-year running, centered average. Source: 1,211 USHCN stations supplemented as needed to achieve a minimum of 92 percent of observations in the 126-year period since Dec 1898. US48: contiguous U.S. states. Tmax: maximum temperature. Tmin: minimum temperature. Source: CWG25 Figure 6.3.3.

How did the flawed figure ES.5 pass the NASEM Review? The NASEM Review panel criticized the discussion of temperature extremes in a late draft of the CSSR. Key Finding 2 of Chapter 6 in that draft stated:

Accompanying the rise is [*sic*] average temperatures, there have been – as is to be expected – increases in extreme temperature events in most parts of the United States. Since the early 1900s, the temperature of extremely cold days has increased throughout the contiguous United States, and the temperature of extremely warm days has increased across much of the

West. In recent decades, intense cold waves have become less common while intense heat waves have become more common. (*Extremely likely, Very high confidence*)

In reference to this NASEM said:

Further, it is difficult to understand how a statement that includes increases in extreme warmth can be associated with a high confidence or extremely likely statement, given that most of the graphics in this chapter show a decrease in extreme warmth in the historical record.

The Federal official in charge of the CSSR (Michael Kuperberg, Executive Director of the USGCRP) responded to the Academies' review by noting that

Almost every recommendation from the NAS was incorporated [in the final version]... and a new figure was added on changes in record high and low temperatures

The "new figure" referred to is the Figure ES.5, which did not appear in the draft reviewed by the Academies' panel. It seems unlikely that the Academies panel ever saw that figure because they surely would have commented if they had and it wouldn't have survived to publication. And the figure's problems were evidently not flagged (or were ignored) in the subsequent internal government reviews.

With this background we now present our critique of NCA5.

2 NCA5 OVERVIEW CHAPTER: HYPERBOLIC ADVOCACY LANGUAGE AND UNSCIENTIFIC TONE

NCA5 Chapter 1, "Overview", holds a prominent place in the Report since it summarizes the entire report and is the only section that many will read. Although the later chapters of NCA5 are not without some merit, Chapter 1 is marred by an activist tone and language that aggressively promotes mitigation policies. As such, this chapter adds an imprimatur of scientific authority to naïve and simplistic declarations of opinion about public policy. Many examples can be cited; here we note a few that are particularly egregious.

Chapter 1 opens as follows:

The more the planet warms, the greater the impacts. Without rapid and deep reductions in global greenhouse gas emissions from human activities, the risks of accelerating sea level rise, intensifying extreme weather, and other harmful climate impacts will continue to grow. Each additional increment of warming is expected to lead to more damage and greater economic losses compared to previous increments of warming, while the risk of catastrophic or unforeseen consequences also increases.

This statement presupposes that all warming is anthropogenic, that all warming is bad and causes economic damage, and that warming intensifies extreme weather. Such sweeping generalizations go

well beyond what science has or can establish. The statement also refers to growing risks without saying whether they were large to begin with – a small risk that grows may still be a small risk, and a large risk may be only incrementally worsened. A more objective version of this paragraph would instead say something like the following:

=====

The Earth is warming because of a combination of natural and anthropogenic influences. This warming will generate a mix of benefits and harms that varies by region, to which society should be prepared to adapt. Some types of extreme weather have worsened recently, while others have not changed or have even declined in intensity. Reducing emissions of greenhouse gases might slow the warming although such policies have proven to be costly and disruptive, so any climate actions need to be weighed against the potential benefits.

=====

On the next page the Overview states:

Each additional increment of warming leads to greater risks [here it lists 7 key components of society including food security and the economy]... Without deeper cuts in global net emissions, climate risks to the US will continue to grow... Action to limit future warming and reduce risks can have near-term benefits and opportunities: low-carbon energy jobs, Improved air quality, Health benefits, Economic benefits...”

The authors write as if climate policy does not involve trade-offs and all measures to reduce future warming will be effective and beneficial. But the vast body of scholarship on climate science and economics does not support such simplistic claims. Not every additional increment of warming leads to economic harms; in fact, NCA5 Chapter 19 acknowledges that there will also be benefits. Nor is climate policy guaranteed to create jobs or benefit the economy; in many cases it has done the opposite. Such deceit is a disservice to policymakers.

Pages 8 and 9 of the Overview promote renewable energy options by noting, correctly, that the leveled costs of wind/solar generation have fallen sharply since 2010, and so offers this rationale for pursuing deep emission reductions:

Recent growth in the capacities of wind, solar, and battery storage technologies is supported by rapidly falling costs of zero- and low-carbon energy technologies, which can support even deeper emissions reductions. For example, wind and solar energy costs dropped 70% and 90%, respectively, over the last decade, while 80% of new generation capacity in 2020 came from renewable sources.

Yet it has long been known that intermittent renewables generation must be supplemented by dispatchable generation to meet grid reliability standards, and that doing so (e.g., through natural gas, fission, or storage) significantly increases the cost of electricity. Further, there are yet unmet synchronization challenges in transmission grids with heavy penetration of wind and solar power. Here again it is advisory malpractice not to acknowledge these facts. But more importantly, we see no reason for the NCA5 to be discussing renewable energy technologies and economics in context of its mandate.

Page 14 of the Overview presents future emission scenarios with the following description: “Climate modeling experts develop global climate projections for a range of plausible futures.” The word “plausible” is applied to all of the scenarios. The accompanying Figure includes both SSP3-7.0 and SSP5-8.5, the latter reaching the same radiative forcing as RCP8.5. The Figure does not compare

observed emissions with previous projections nor does it caution readers that SSP3-7.0 and SSP5-8.5 are extreme scenarios that, like RCP8.5, have been heavily criticized in the scientific literature as being implausible (CWG25 3.2.1). By describing the entire envelope of emission projections as “plausible” the report opens the door to later presenting impacts associated with ~~extreme and implausible~~ worst case emission scenarios as part of a baseline “business-as-usual” future.

Page 17 of the Overview introduces the discussion of risks from extreme weather events by saying “Harmful impacts from more frequent and severe extremes are increasing across the country.” This creates the impression that extreme weather events are worsening and that disaster losses are driven by trends in extreme weather. While the section goes on to acknowledge that some of the increase is due to increases in the value of assets at risk, it then invokes the NOAA Billion Dollar Dataset as evidence of extreme weather getting worse. Scientists have shown that this is an invalid metric (CWG 10.2) since it measures the growth of the economy not the frequency of extreme weather, and indeed NOAA has recently withdrawn the data product (Pielke Jr. 2024, 2025). Even though the dataset was still distributed by NOAA at the time of the NCA5, the report authors failed to assess it skeptically and see that it was unfit for the purpose of measuring climate trends.

Page 23 of the Overview states, in large font:

Climate changes are making it harder to maintain safe homes and healthy families; reliable public services; a sustainable economy; thriving ecosystems, cultures, and traditions; and strong communities.

It is pointless to try to evaluate this statement on scholarly grounds; it is self-evidently hyperbolic. This kind of language doesn’t belong in a scientific assessment report. Its prominent inclusion points not only to the willingness of NCA5 authors to promote alarm, but also the ineffectiveness of the review process in eliminating such statements.

3 OVERCONFIDENCE WHEN STATING CONCLUSIONS

3.1 Inflated certainty levels

Overconfidence in stating conclusions has been an endemic problem in NCA Reports. The authors frequently make sweeping generalizations without appropriate caveats or acknowledging uncertainties. The overconfidence begins with inflated language to describe certainty levels.

NCA5 uses specific terms to convey information about scientific confidence associated with important finds, observations and projections. The Front Matter of NCA5 states that

confidence in a finding is based on the type, amount, quality, strength, and consistency of evidence; the skill, range, and consistency of methods to detect, evaluate, attribute, and interpret climate trends; and the degree of agreement across scientific information sources.

and Table 1 from the Front Matter provides calibrated language for confidence assessment:

Very high:	Strong evidence (established theory, multiple sources, well documented and accepted methods, etc.). High consensus
High:	Moderate evidence (several sources, some consistency, methods vary and/or documentation limited, etc.). Medium consensus

- Medium: Suggestive evidence (a few sources, limited consistency, methods emerging, etc.)
Competing schools of thought.
- Low: Inconclusive evidence (limited sources, extrapolations, inconsistent findings, poor documentation and/or methods not tested, etc.). Disagreement or lack of opinions among experts.

This terminology is obviously inflated: *high confidence* with just moderate evidence and medium consensus; *medium confidence* with only suggestive evidence and competing schools of thought. This inflation in terminology leads to overconfidence in conclusions.

Even with this inflated terminology, NCA5 further inflates the confidence level of many of its conclusions to well beyond what the IPCC has concluded with more thorough justification, and also by incorrectly applying its own standards. An example is the conclusion about anthropogenic influence on climate change, arguably one of the most important scientific statements of the report.

Key Message 3.1 Traceable Account states:

There is *very high confidence* that emissions of GHGs from human activities, fossil fuel use in particular, have unequivocally caused *all* global warming observed over the industrial era.

while the corresponding statements from IPCC AR5 and AR6 are

AR5: It is *extremely likely* that *more than half* of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic increase in greenhouse gas concentrations and other anthropogenic forcings together. (IPCC, 2013)

AR6: The *likely* range of total human-caused global surface temperature increase from 1850–1900 to 2010–2019 is 0.8°C to 1.3°C, with a best estimate of 1.07°C. It is *likely* that well-mixed GHGs contributed a warming of 1.0°C to 2.0°C, other human drivers (principally aerosols) contributed a cooling of 0.0°C to 0.8°C, natural drivers changed global surface temperature by –0.1°C to +0.1°C, and internal variability changed it by –0.2°C to +0.2°C. It is *very likely* that well-mixed GHGs were the main driver of tropospheric warming since 1979.

The IPCC AR5 and AR6 statements provide likelihood assessments but not a confidence level. While NCA5 claims with *very high confidence* that fossil fuels have unequivocally caused *all* global warming, AR5 refers to “*more than half* of the observed warming” and AR6 provides a more nuanced statement that relates to a *likely* range of warming contributed to by human drivers.

3.2 Overstating findings in underlying sources

Although we did not do a detailed audit of NCA5’s use of source material, spot checks turned up evidence of a pattern of overstatement.

Chapter 2 page 11 reports on an increase in precipitation in some areas and attributes it to “climate change”:

Many eastern regions of the country are getting wetter (Figure 2.4). Average annual precipitation from 2002-2021 was 5%-15% higher relative to the 1901-1960 average in the central and eastern US, a trend attributable to climate change.

The claims were attributed to Knutson and Zeng (2018). But Knutson and Zeng did not say these things. They examined linear trends over 1901 – 2010, 1951 – 2010 and 1981 – 2010. They did not compare average rainfall over 2002 - 2021 to average rainfall over 1901 – 1960, if only because their study was published in 2018. For 1981-2010, they noted stronger trends in some areas but cautioned that such changes are consistent with natural variability, and they did not claim attributable trends were observed over the United States:

Observed annual precipitation trends over the recent 30-yr period 1981–2010 (Fig. 5) have generally stronger magnitudes (in mm yr⁻¹ decade⁻¹) than observed trends for 1901–2010 or 1951–2010. This is as expected since trends over a shorter period have stronger potential for occurrence of pronounced temporary trends due to internal variability alone. Only 9% of the analyzed area has detectable and attributable anthropogenic influence (categories -3, -2, +2, +3), which represents less than one-third of the fractional areal coverage of such trends for 1901–2010 (29%). ... Eight percent of the analyzed area has attributable anthropogenic *increases* (categories +2, +3), including parts of eastern Europe, northern Asia, northern Australia/Maritime Continent, and tropical Africa.

As another example of overstating findings, NCA5's Chapter 2 page 18 states

There is robust evidence that human-caused warming has contributed to increases in the frequency and severity of the heaviest precipitation events across nearly 70% of the US.

This is apparently attributed to two papers Diffenbaugh *et al.* (2018) and Kirchmeier-Young and Zhang (2020). Diffenbaugh *et al.* presented ratios of observed occurrences of extreme events to simulated occurrence rates in CMIP6 models run with only natural forcings. They report that for 79% of the U.S., extreme rainfall event frequencies are currently higher than in model simulations, and the ratio of occurrences will rise under future warming simulations. This is not “robust” evidence of anthropogenic influence since it requires readers to assume that climate models provide accurate simulations of regional precipitation patterns, something that even IPCC AR6 admits is uncertain (AR6 WGI SPM Box SPM 1.2, SPM Section C.1.3).

Kirchmeier-Young and Zhang looked at extreme 1- and 5-day events in North America and, using three global climate models, found

A signal of combined anthropogenic and natural external forcing can be detected in the intensification of extreme precipitation at the continental scale over North America. In some cases, this intensification can be attributed to human influence specifically.

However, they noted large differences among the three models in their simulated precipitation changes. Also, two of the three models failed to yield attribution for 5-day events for the North America mean. In other words, the models disagreed on whether the observed changes were anthropogenic. Both cited references utilized the implausible RCP8.5 scenario and began their “historical” observational records only in 1961. Here again this is not “robust” evidence, it is merely suggestive, particularly since other studies have found natural variability predominant.

3.3 Technical example: Emergent constraints

Some of the overconfidence expressed by NCA5 arises by omitting discussion of counterevidence in the peer reviewed literature. An example is the topic of “emergent constraints”. Chapter 3 page 17 invokes this concept to support its claim that key uncertainties in climate model projections have been reduced:

An approach to reduce uncertainty in climate change projections has matured over the past decade. It is known as "emergent constraints." The term refers to strong statistical relationships between highly uncertain future climate parameters and observable trends or variations in the current climate, along with a physical explanation of this relationship.

Emergent constraints appeared in the climate modeling literature as an attempt to tie climate model behavior to climate observations in hopes of generating insight into real-world equilibrium climate sensitivity to a doubling of carbon dioxide (ECS). Climate models exhibit a wide range of ECS values. The idea of emergent constraints is to examine whether the models with shared sensitivity values also share a common representation of some climate process (usually related to clouds) that might indirectly influence ECS. Suppose, for instance, that in low-ECS models the total cloud fraction in the tropics is strongly correlated with that in the southern midlatitudes but in high-ECS models the correlation is weak. Then researchers could examine whether the observed correlation is strong or weak and draw a conclusion about which type of model, and therefore which ECS value, is more likely.

A problem in the emergent constraint literature is that there has been a proliferation of proposed correlations with little physical motivation. As shown by Schlund *et al.* (2020) many emergent constraints patterned on CMIP5 models (Coupled Model Intercomparison Project No. 5, used for the IPCC 5th Assessment Report) failed to work on CMIP6 models (used for the IPCC 6th Assessment Report). In other words, the observed correlations in CMIP5 models between ECS and cloud processes failed to show up in CMIP6 models, indicating that they were likely spurious rather than clues to physical processes governing the climate system. As a result, emergent constraints estimated on CMIP5 models *increased* the uncertainty of ECS, rather than decreasing it as intended and as claimed by NCA5.

Schlund *et al.* summarized the problem as follows [**boldface** added for emphasis]

In this study, we systematically analyze 11 published emergent constraints on ECS that have mostly been derived from models participating in the Coupled Model Intercomparison Project Phase 5 (CMIP5) project... The focus of the study is on testing if these emergent constraints hold for [Earth System Models] participating in the new Phase 6 (CMIP6). Since none of the emergent constraints considered here have been derived using the CMIP6 ensemble, CMIP6 can be used for cross-checking of the emergent constraints on a new model ensemble. **The application of the emergent constraints to CMIP6 data shows a decrease in skill and statistical significance of the emergent relationship for nearly all constraints, with this decrease being large in many cases.** Consequently, the size of the constrained ECS ranges (66% confidence intervals) widens by 51% on average in CMIP6 compared to CMIP5.

Yet NCA5 described the use of emergent constraint analysis as a great “advance” that reduced uncertainty in climate model projections.

4 RELIANCE ON SHORT TIME PERIODS FOR TREND ANALYSIS

In CWG25 Chapter 6 we discussed the need for care in the choice of time scale when making claims about trends in extreme weather. We provided examples from analysis of river flooding, heatwaves, and extreme precipitation to show how assertions about apparent trends based on short data sets fall apart when looking at longer versions of the same data sets. Here are some examples of this problem from NCA5.

4.1 Average and Extreme Precipitation

McKittrick and Christy (2019) showed that apparently significant positive trends in U.S. average and extreme precipitation over the NCA4 interval (1901 – 2016) disappeared on longer samples (extending back as far as the 1840s, depending on location) or on a shorter interval coinciding with the final 40 years of the data then available (1978 – 2017). In CWG25 Section 6.4 we presented analyses of updated data for the same locations (and many others), in all cases finding both considerable regional heterogeneity and that trends detectable on one time scale are often not detected on longer or shorter time scales. These findings argue against simple attribution of changes to anthropogenic influences.

NCA5 did not continue the NCA4 precedent of using the post-1901 interval as the time scale for its precipitation discussion. Instead it refers to changes “since the 1950s”; NCA5 Figure 2.8 suggests 1958 might be the intended start date. Under Key Message 2.2 “Extreme Events Are Becoming More Frequent and Severe” (p. 2-16) NCA5 states (p. 2-18):

Rainfall is becoming more extreme
Since the 1950s, there has been an upward trend in heavy precipitation across the contiguous US. This increase is driven largely by more frequent precipitation extremes, with relatively smaller changes in their intensity.

In addition to our concerns that inferences about trends are contingent on choice of time scale, we cannot reproduce the finding that positive trends are observed in extreme precipitation across all CONUS regions. We extended the data used in CWG25 (McKittrick and Christy 2025) to include 141 stations across the US in the Pacific Coast, Midwest, Northeast and Southeast regions (Christy 2025). See details in Appendix 2. Many post-1950 trends are positive but statistically insignificant depending on the measure of extreme precipitation. It is possible to find locations that support the NCA5 statement, such as the Southeast post-1950, but results are not robust to selecting longer or shorter time scales of analysis nor do they generalize across all regions.

The following is a more accurate summary of what U.S. data show.

There are regionally heterogeneous changes in average and extreme precipitation. Positive trends in annual average rainfall and extreme events (defined either as the annual maximum or the number of exceedances of the 99th percentile value) are generally weak or non-existent when looking at samples exceeding 130 years in length. Significant trends can be found when beginning the sample in the 1950s although in most cases the trends weaken and become insignificant when looking at the post-1980 interval. This argues against attribution of changes in precipitation to anthropogenic warming.

4.2 Heatwaves

In contrast to NCA5, NCA4 examined heat extremes across the entire 20th century, pointing out that peak heat wave activity was reached in the 1930s and has decreased since then, and that recent increases are confined to areas west of the Rockies. NCA4 stated:

[The] warmest daily temperature of the year increased in some parts of the West over the past century, but there were decreases in almost all locations east of the Rocky Mountains. In fact, all eastern regions experienced a net decrease, most notably the Midwest (about 2.2°F [1.2°C]) and the Southeast (roughly 1.5°F [0.8°C]).

Since the mid-1960s, there has been only a very slight increase in the warmest daily temperature of the year (amidst large interannual variability). Heat waves (6-day periods with a maximum temperature above the 90th percentile for 1961–1990) increased in frequency until the mid-1930s, became considerably less common through the mid-1960s, and increased in frequency again thereafter. As with warm daily temperatures, heat wave magnitude reached a maximum in the 1930s. (NCA4 pp. 190-191)

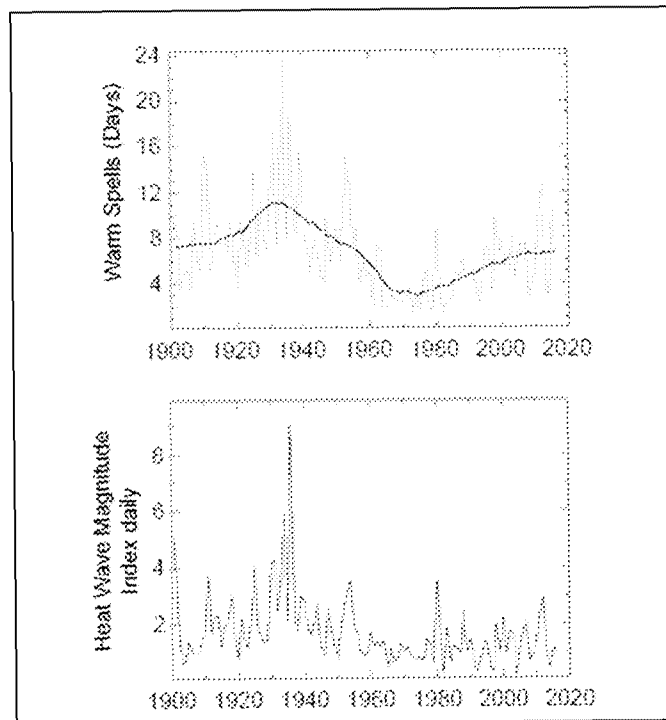


FIGURE 3. U.S. Heat waves since 1900. Reproduction of NCA4 Figure 6.4

Contrast this careful and factual language from NCA4 with NCA5 Key Message 2.2: “Extreme Events Are Becoming More Frequent and Severe.” This blanket statement is followed by NCA5 Figure 2.7 (reproduced as Figure 4 below) which shows the number of hot days, cold days and warm nights (respectively in panels a—c) over the period 2002-2021 compared to 1901-1960. [Presumably these are annual counts, although not stated in the caption.]

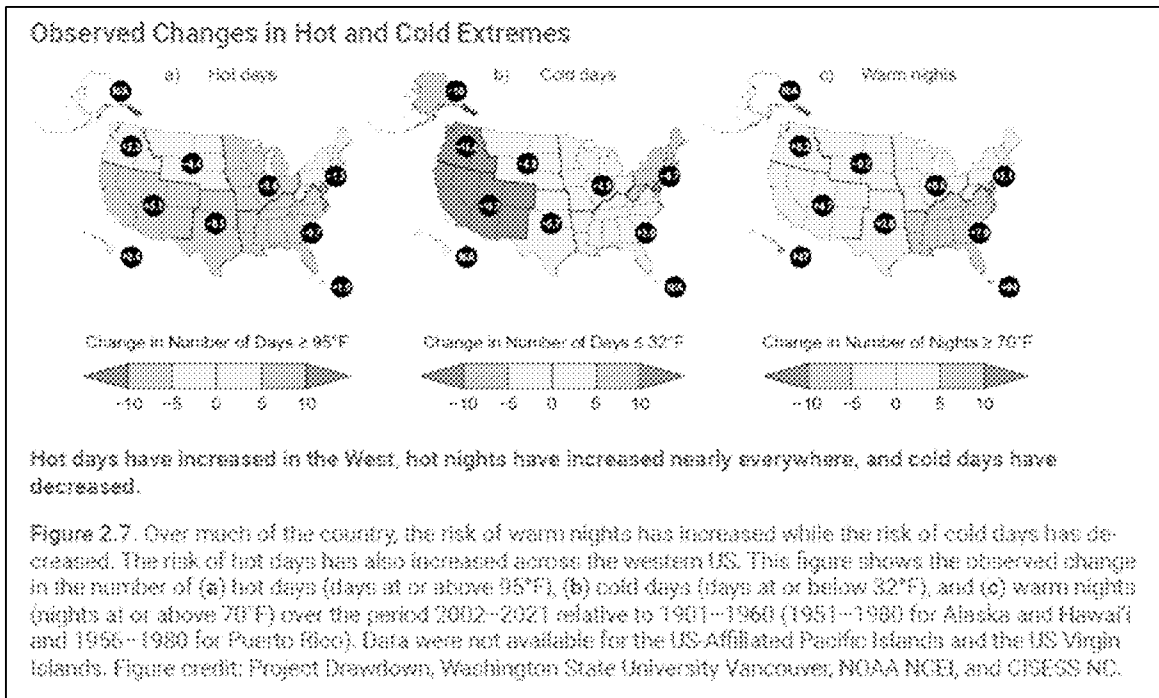


FIGURE 4: Reproduction of NCA5 Figure 2.7.

Close inspection shows that this figure actually contradicts the NCA5 Key Message with respect to heatwaves and instead reinforces the position of NCA4. Notwithstanding Key Message 2.2, the leftmost panel in Figure 2.7 above shows that over most of CONUS the number of extreme heat days has *decreased* in recent decades compared to the prior century.

The accompanying discussion in NCA5 becomes convoluted as it appears to be aimed at supporting the Key Message despite the contrary evidence. NCA5 Chapter 2 elaborates on Key Message 2.2 by stating (page 16):

Observations show an increase in the severity, extent, and/or frequency of multiple types of extreme events. Heatwaves have become more common and severe in the West since the 1980s (*high confidence*).

But while it mentions the increase in hot days in the West, it fails to mention the decrease everywhere east of the Rockies. On the next page (page 17) it raises the comparison to the 1930s and then switches to discussing global counts:

By some measures, the most extreme heatwaves on record in the United States occurred during the Dust Bowl era of the 1930s. ... Globally such heatwaves are becoming more frequent, and in recent decades the western United States has been following those trends.

The reference to a global trend seems to be an attempt to tie heatwaves to anthropogenic climate change. But the obvious question, unaddressed by NCA5, is why one region follows the global pattern of increasing heatwaves while most of the country is trending in the opposite direction. These issues are addressed in Chapter 6 of CWG25, demonstrating that the range and magnitude of extreme temperatures (10s of degrees) are driven more by natural variability than by the small anthropogenic forcing. The analysis in CWG25 shows that for both (a) hot days ($\geq 95^{\circ}\text{F}$) and (b) number of days in heatwaves, the current decade is no hotter than a century ago in the U.S. Thus, the NCA5 claim that

“multiday heatwaves have become hotter, more frequent, larger, and longer lasting in recent decades,” is simply false when expanding the temporal and spatial domains to encompass all available data (Chapter 6 and Figure 6.3.6 of CWG25).

NCA5 then pointed to the dramatic Pacific Northwest heatwave of 2021. CWG2025 Section 8.6.1 discussed this event in detail, reviewing the multiple peer reviewed studies that explained the unusual meteorological context was unrelated to human-caused climate change, a point omitted from the NCA5 discussion.

NCA5 finally addresses the declining heatwave trend in CONUS east of the Rockies but attempts to reframe it by focusing on urban warm spells.

[The] number of very hot days has actually decreased across the central and eastern regions due to summer cooling trends in the region (Figure 2.7; Ch. 22). This does not, however, mean the central and eastern US are not affected by heat. The impacts of extreme high temperatures are more severe if such conditions persist for several days, and overall, multiday heatwaves have become hotter, more frequent, larger, and longer lasting in recent decades. Across 50 large US cities, the US Global Change Research Program heatwave indicator (<https://www.globalchange.gov/indicators/heat-waves>) shows that the average number of heatwaves has doubled since the 1980s, and the length of the heatwave season has increased from about 40 days to about 70 days.

We discussed this part of NCA5 in CWG25 Section 6.3. The figure referenced by NCA5 uses  an *ad hoc* definition of heat wave, namely two consecutive days with minimum nighttime temperatures above the 85th percentile,  and a short time period which begins in the 1960s, the coldest decade in the last century, thus suppressing any comparison to the 1930s. Further, nighttime temperatures in urban areas have increased faster than daytime temperatures (which NCA5 acknowledges), but this is a signature of urban heat islands and not a good metric of climate change. CWG25 found that the occurrence of hot days ($\geq 95^{\circ}\text{F}$) has recently increased in the West, but declined in the remainder of the country, and in the nationwide average, since 1899.

5 INADEQUATE TRACEABLE ACCOUNTS

NCA3 began the practice of including a section on Traceable Accounts at the end of each chapter. This is the description from NCA5:

Each chapter concludes with a section entitled Traceable Accounts, which provides information on the overall process used to develop the chapter as well as a separate Traceable Account section for each Key Message. These Traceable Accounts describe the supporting evidence behind each Key Message, the process and rationale authors used in reaching their conclusions, and the author team’s expert assessment of the confidence in and, where applicable, likelihood of these conclusions. As such, Traceable Accounts provide information about the state of the science, document sources of uncertainty, identify research gaps, and allow traceability to data and resources.

The Traceable Accounts for each Key Message includes the following sections:

- Description of Evidence Base
- Major Uncertainties and Research Gaps
- Description of Confidence and Likelihood

The Traceable Accounts could have addressed the statutory requirement that the NCA discuss scientific uncertainties. They could also help satisfy the Executive Order for Restoring Gold Standard Science by addressing reproducibility, transparency, communication of error and uncertainty, and skepticism of findings and assumptions. However, the Traceable Accounts in NCA5's Chapters 2 and 3 are uneven, often superficial and uninformative.

An example of a deficient Traceable Account is NCA5's Key Message 2.2: "Extreme Events are Becoming More Frequent and Severe". The "Description of the Evidence Base" offers two paragraphs, the first summarizing the findings and the second generically describing the types of data that can be used for storms. "Major Uncertainties and Research Gaps" focuses on the uneven distribution across U.S. populations due to differences in exposure and vulnerability. The only limitations in data referred to are the lack of a long-term record of lightning and the lack of homogenized daily and hourly temperature data apart from reanalysis products.

But the most astonishing deficiency is in the "Description of Confidence and Likelihood." One of the statements in Key Message 2.2 is:

Hurricanes have been intensifying more rapidly since the 1980s (*high confidence*) and causing heavier rainfall and higher storm surges (*high confidence*).

The Description of Confidence and Likelihood includes the following statement:

Basic physical understanding and climate models both provide robust explanations for the links between climate change and observed changes in these extremes: this is why the authors also have high confidence that storms are delivering more rainfall and high confidence that storm surges are becoming higher.

No reference to journal publications or a specific data set is made anywhere in the Chapter regarding hurricane-induced precipitation or storm surge to support this *high confidence* conclusion.

The Traceable Accounts for the various Key Findings of Chapter 3 have some substantial inconsistencies. Consider

Key Message 3-1: Human activities have caused global warming.
Confidence and Likelihood: "There is *very high confidence* that emissions of GHGs from human activities, fossil fuel use in particular, have *unequivocally* caused all global warming observed over the industrial era. There is also *very high confidence* that changes in natural climate drivers have had globally small and regionally variable long-term effects over this period."

The Uncertainties section addresses only uncertainties in radiative forcing by greenhouse gases, ignoring the great uncertainty in model response (CWG XX) In contrast, the Traceability Analysis of Key Message 3-4 ("Humans Are Changing Earth System Processes") raises the problem that relatively little is known about the role of natural variability at the regional scale. From its Description of Evidence Base:

In the last decade, there has been increasing recognition of the role of regional-scale natural variability in the past and future evolution of climate, as well as the fact that regional natural variability signals can be competitive with forced anthropogenic signals.

And from its Major Uncertainties and Research Gaps:

For example, the true natural variability of the climate system on decadal to centennial timescales could be larger than what we estimate from GCMs, which would further increase the irreducible uncertainty stemming from natural variability.

These statements are among the most scientifically credible in the entire NCA5 and they directly undercut the confidence assigned to Key Message 3-1.

There is also a generic problem in tracing NCA5's Traceable Accounts. The Front Matter of NCA5 states:

Each figure and some tables are accompanied by a metadata survey, which can be accessed in the online version of the report by clicking on the eyeball icon above the figure or table (see the table below for explanations of additional icons used throughout the report). The metadata survey describes data sources, figure or table development methods, copyright information, and other important documentation.

Clicking on the eyeball icon does not reveal the metadata information; instead a "Contact Us" email appears, addressed to the USGCRP. This is an inadequate way to archive the metadata information.

In summary, the Traceable Analyses examined here, with few exceptions, fail to meet the stated objectives of the NCA.

6 OVEREMPHASIS ON EXTREME SCENARIOS

To respond to the GCRA mandate to "project major trends for the subsequent 25 to 100 years," NCA5 relies on projections of future climate change based on estimates of future emissions (the so-called SSP scenarios) and/or specified levels of radiative forcing (the RCP scenarios). For the most part, NCA5 uses scenarios developed for the IPCC Assessment Reports.

In CWG Section 3.2.1 we presented a critical assessment of past and current IPCC scenario envelopes, showing that they have tended to overshoot observed emissions. The IPCC AR6 published in 2021 stated that "The likelihood of high-emission scenarios like RCP8.5 and SSP5-8.5 is considered low in light of recent energy sector developments." and that same year UN Climate Negotiators (COP) stopped using scenarios above 4.5.

NCA5 makes the following observations about the scenarios they use:

NCA5 authors were advised to assess the full range of scenarios available. (Front Matter)

Scenarios of future emissions and land-use change are developed as plausible alternatives, but no relative likelihood is attached to them. Some recent studies, however, have argued that

the highest scenario, SSP5-8.5, is no longer plausible without a reversal of current trends in the adoption of renewables and energy efficiency. (Key Message 3.3 Traceable Analysis)

Despite acknowledging the issue, NCA5 otherwise ignored the problem. A keyword search of NCA5 of mentions of RCP/SSP scenarios finds over 50% referred to the extreme emissions scenarios RCP8.5/SSP5-8.5. Further, nine NCA5 figures (5.2, 6.9, 7.4, 11.3, 14.6, 22.13, 22.19, 27.9, 29.13) included *only* the 8.5 scenarios.

The problem of relying on extreme scenarios is particularly acute for NCA5's sea level rise projections. The sea level rise scenarios used in NCA5 do not relate directly to the SSP emissions scenarios, but rather to specified amounts of sea level rise by 2100. Table 4 of NCA5's "Guide to Using this Report" reproduced below shows that Low relates to 0.3 m (0.98 feet), Intermediate-Low relates to 0.5 m (1.64 feet), Intermediate relates to 1.0 m (3.28 feet), Intermediate-High relates to 1.5 m (4.92 feet), and High relates to 2.0 m (6.56 feet).

Table 4. Descriptive Terms for Common Sea Level Rise Scenarios Used in NCA5						
Future global mean sea level rise and sea level rise along United States coastline are shown for five scenarios in feet (and meters), relative to a 2000 baseline. The US values shown in the right half of the table are averaged across the US coastal regions, including the contiguous US, Alaska, Hawaii, and the US-Affiliated Pacific Islands, and the US Caribbean. The national values shown in the table differ substantially from regional values. For example, sea level rise is higher in the Gulf Coast and lower or even negative in some parts of Alaska. In the next 30 years (2020–2050), sea level along the contiguous US coasts is expected to rise 0.92 feet (0.28 m), the same amount of sea level rise observed over the last 100 years (1920–2020). See Chapter 9 for regional sea level information. Adapted from Sweet et al. 2022.”						
Sea Level Rise Scenario Descriptor	Global Mean Sea Level			United States		
Year	2050	2100	2150	2050	2100	2150
Low	0.49 (0.15)	0.98 (0.3)	1.31 (0.4)	0.59 (0.18)	0.98 (0.3)	1.64 (0.5)
Intermediate-Low	0.66 (0.20)	1.64 (0.5)	2.62 (0.8)	0.75 (0.23)	1.64 (0.5)	2.95 (0.9)
Intermediate	0.92 (0.28)	3.28 (1.0)	6.23 (1.9)	0.89 (0.27)	3.28 (1.0)	6.89 (2.1)
Intermediate-High	1.21 (0.37)	4.92 (1.5)	8.86 (2.7)	1.12 (0.34)	4.92 (1.5)	8.86 (2.7)
High	1.41 (0.43)	6.56 (2.0)	12.14 (3.7)	1.38 (0.42)	6.56 (2.0)	12.46 (3.8)

TABLE 1: Reproduction of Table 4 from the Front Matter of NCA5

Considering only projections representing processes quantified with at least medium confidence, IPCC AR6 assessed global mean sea level projections for all emissions scenarios (including implausible extreme emissions scenarios) for 2100 to fall between 0.2 and 1.6 m (5th—95th percentile range). Nevertheless, the range of sea level rise scenarios considered by NCA5 extends to 2.0 m. Further, NCA5 fails to include plausible lower scenarios, such as 0.2 m cited by the IPCC, which also corresponds to the average rate of sea level rise over the past century.

Chapter 9 of NCA5 offers the following predictions of sea level rise:

“Under a range of potential global warming levels, average sea level along US coastlines is *likely* to be between 12 and 20 inches above 2000 sea levels in 2050 (Figure 9.2).”

The projected sea level rise values span from the Intermediate scenario to values slightly greater than the High scenario. They can be put into context by considering the observed global sea level rise from 2000-2024, approximately 3.39 inches (0.28 feet). NCA5 is thus projecting a sea level rise during 2025 and 2050 that is 3.5 to 5.8 times the rate observed during 2000-2024, an exceedingly implausible outcome. Chapter 9 further states:

“Looking toward the future, an 11 inch (28 cm) average rise along the contiguous US coastline is expected by 2050 (relative to 2020), with a *likely* range of 9-13 inches.”

...

“There is *high confidence* and it is *likely* that sea levels will rise about 11 inches (likely range of about 9–13 inches) between 2020 and 2050”

In summary, NCA5 presents future sea level rise scenarios that are not directly relatable to either SSP/RCP emissions scenarios or to plausible global warming levels. The NCA5 scenarios include two scenarios that are higher than the 95th percentile for the extreme emissions scenario RCP8.5 and include hypothesized ice sheet processes in which there is low confidence. Projections to 2050 require rates of sea level rise from 2025 to 2050 that are more than triple the rate observed during 2000-2024. Further, NCA5 ascribes *high confidence* to these sea level rise projections. CWG25 Section 7.3 provides further context for USGCRP projections of extraordinary sea level rise in the next 25 years.

More generally, NCA5’s inclusion, and even focus, on implausible extreme scenarios supports projections of alarming impacts that are very unlikely to be driven by anthropogenic warming.

7 CONFLATION OF NATURAL AND ANTHROPOGENIC CLIMATE CHANGES

NCA5’s Glossary defines “climate change” as a change in climate for any reason. This is technically correct, but at variance with the (now) popular perception of all climate changes being anthropogenic. The distinction is not academic- it is central both to attribution questions and to projections, since anthropogenic changes would respond to mitigation, while natural changes are unavoidable.

The discussion on NCA5 page 2-4 begins “Human activities are changing the climate”, then goes on to list evidence for anthropogenic GHG emissions and climate warming. The next paragraph begins “Climate change is happening now in the United States. Including Alaska, the continental US has been warming about 60% faster than the planet as a whole since 1970.” In context the implication is that the warming of CONUS faster than the planetary average is an effect of GHG emissions. But it is an artifact of the Earth’s surface being 70 percent ocean. Since the ocean warms more slowly than land, comparison of any land surface outside the tropics with the global average would show the land surface to be warming faster than the global average, regardless of the cause of the warming.

The same page goes on to say “Climate change is already affecting people in the United States. Extreme heat was estimated to be responsible for more than 700 deaths per year between 2004 and 2018 although some estimates put heat-related mortality closer to 1,300 deaths annually.” But extreme heat, whether naturally-caused or not, has always been a risk to human health. As to trends, the data show that adaptation has caused the mortality burden of extreme heat to drop substantially in recent decades (CWG25 Section 10.3.1).

Consider also the NCA5 statement on precipitation that we cited in Section 3.2:

Many eastern regions of the country are getting wetter (Figure 2.4). Average annual precipitation from 2002-2021 was 5%-15% higher relative to the 1901-1960 average in the central and eastern US, a trend attributable to climate change.

The attribution is superfluous because the statement is a tautology by NCA5's definition of climate change. But its gratuitous inclusion effectively attributes the observed trend to greenhouse gas emissions.

Exploitation of the ambiguity in "climate change" is endemic to NCA5. The NASEM review (pp. 23-24) commented on this problem, and it could have been easily addressed by adopting the phrase "changing climate" for general changes while reserving the term "climate change" for anthropogenic changes. But the NCA5 authors seemingly ignored their recommendation.

A separate but related issue is use of the term "climate change" to refer to increases in socioeconomic vulnerabilities that have anthropogenic but non-GHG-related causes. NCA5 page 1-19 states "Climate change exacerbates inequalities." But the issue discussed is the negative correlation between neighborhood-level income and land surface temperatures (LST) in urban areas. To the extent the correlation is real the most likely explanation is that low-income households concentrate where housing is less expensive, which may be in neighborhoods with less nearby parkland and tree cover, which has nothing to do with CO₂ emissions. Similarly the NCA5 makes repeated reference to the Billion Dollar Disaster dataset which is dominated by trends in population and economic growth, as we discussed in CWG25 Section 10.2.

8 SUMMARY EVALUATION OF NCA5 AND RECOMMENDATIONS FOR NCA6

This chapter summarizes our evaluation of NCA5 relative to OSTP's charge: whether NCA5 (1) complied with the USGCRP's statutory obligation; (2) adheres to the core tenets of Gold Standard Science; and (3) can suitably inform federal climate and energy policy. The points made in this summary analysis refer to specific sections of this report as well as to the CWG25 report.

8.1 Compliance with USGCRP's statutory obligation

As cited in Section 1.2 of this report, the Global Change Research Act requires an assessment that:

- (1) integrates, evaluates, and interprets the findings of the [Global Change Research] Program and discusses the scientific uncertainties associated with such findings;
- (2) analyzes the effects of global change on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biological diversity; and
- (3) analyzes current trends in global change, both human-induced and natural, and projects major trends for the subsequent 25 to 100 years.

We deem NCA5 to have fallen short when evaluated against these criteria because of the following major shortcomings (each is detailed in the chapters cited):

- Inadequate assessment of the relevant topics in climate science and the hazard components of climate impacts. NCA5 instead focuses on evaluation of societal vulnerabilities, “Climate Action,” and policy recommendations with a social justice emphasis (Section 1.2).
- Overconfidence in conclusions and inadequate assessment of uncertainties (Section 3.1.5)
- Inadequate discrimination between natural and human-induced causes of trends and impacts (Chapter 7)
- Inadequate analysis of climate trends by relying on short time periods (Chapter 6)
- Uncritical evaluation of emission scenarios and climate simulations in making projections for the next 25 to 100 years (Chapter 6; Section 3.2.1 and Chapter 5 of CWG25).

8.2 Adherence to the tenets of Gold Standard Science

With respect to the tenets of Gold Standard science listed in Section 1.2 of this report, we have identified the following major shortcomings in NCA5:

- **Lack of reproducibility.** In the few examples that we examined closely, we identified an instance where we could not reproduce the findings of the NCA5, a task that should require only rudimentary data analysis (Section 4.1)
- **Lack of transparency.** In many instances, the Traceable Account fails to justify the Key Finding. Metadata was not readily accessible. (Chapter 5)
- **Inadequate communication of error and uncertainty.** The Traceable Account for each Key Message provides a section on Major Uncertainties and Research Gaps; most of the accounts that we examined were superficial and uninformative. (Chapter 5)
- **Not skeptical of findings and assumptions.** The main text of the chapters is, with few exceptions, not skeptical of its findings and assumptions. (Chapters 3, 5)
- **Some hypotheses and Key Messages are not falsifiable.** Key Message 13.4 is but one of many examples: “Equitable Distribution of Transportation Trade-offs and Benefits Requires Community Involvement.”
- Failure to acknowledge benefits of warming and additional atmospheric CO₂ (CWG25 Section 2.1, Chapter 9)
- **Inadequacy of the peer review process.** The review of the NCA5 Third Order Draft by National Academies of Science, Engineering and Medicine (NASEM) identified some of the deficiencies we have noted, but the NCA5 authors were not obligated to adopt the NASEM recommendations. More importantly, we’ve identified many other deficiencies in NCA5; the NASEM review did not point them out and thus lacked the rigor expected of NASEM reports. (Section 1.4, Chapter 7)

8.3 Suitability for informing Federal climate and energy policy

We assess that the selection and presentation of information in NCA5 makes it an unreliable basis for U.S. climate and energy policymaking. For each of the elements of knowledge characterization suitable for risk management listed in Section 1.3, here are specific examples where NCA5 falls short:

- The degree to which the assumptions made are reasonable/realistic based on background knowledge
 - NCA5 focused on implausibly extreme scenarios for emissions and sea level rise scenarios and made policy recommendations without adequate consideration of the costs

- The degree to which data/information exists and are reliable and relevant
 - NCA5's assumptions about model reliability, and its use of short time periods for analysis, does not support its high-confidence conclusions
- The degree to which there is disagreement among experts, including those from different environments or academic fields
 - While NCA5 was an interdisciplinary effort, the concerns we have raised all point to a failure to canvass or communicate the full range of evidence including data and research findings that speak against Key Messages.
- The degree to which the phenomena involved are understood and accurate models exist
 - NCA5 is not appropriately skeptical of the ability of climate models to attribute the causes of warming and extreme events or to project future climates
- The degree to which the knowledge has been thoroughly examined with respect to unknown knowns
 - A major NCA5 shortcoming is its dismissal of natural climate variability in many contexts where it should have been a major consideration

NCA5 is also problematic for informing policy because its hyperbolic language promotes alarm and advocates for specific policies without proper analysis of marginal costs and benefits. In recent decades, climate science has engendered passion and emotion. Indeed, some younger climate scientists have gone into the field to "save the planet." The NASEM Review of the NCA5 underscores the endemic nature of this problem - their review appears to be written by authors who share many of the biases of the NCA5 team, with an inordinate focus in the review on social and policy issues. It is then not surprising that objectivity can suffer when climate scientists communicate their understanding to non-experts. Further, the field of climate science has been politicized by NetZero mandates. This lack of objectivity usurps the public's right to make informed choices and undermines their confidence in the scientific enterprise.

Philip Handler, President of the National Academy of Sciences, identified the problem forty-five years ago in an editorial that still resonates:

Difficulty arises in the scientific community from confusion of the role of scientist *qua* scientist with that of scientist as citizen, confusion of the ethical code of the scientist with the obligation of the citizen, blurring the distinction between intrinsically scientific and intrinsically political questions. When scientists fail to recognize these boundaries, their own ideological beliefs, usually unspoken, easily becloud seemingly scientific debate.

8.4 Recommendations for NCA6

While we have assessed NCA5 to be scientifically inadequate and unsuitable as a basis for decision-making, one can imagine a different National Climate Assessment that meets statutory and policymaker requirements. The goal should be not to persuade, but to impart understanding by being objective, transparent and complete. A suitable NCA would be an important complement to IPCC assessments to the extent that its analysis and conclusions differed from the oracular "consensus" of the IPCC reports and additional topics are addressed. Such a report would promote a more open scientific discussion and a more informed policy debate.

We recommend that the NCA6 have a narrower scope than NCA5, refocusing on climate science, including natural climate variability, with topics to include:

- How the climate has changed in the past. The U.S. has the best and longest meteorological records and they should be examined and displayed in their entirety. Trend analyses should include longest periods available and employ suitable statistical methods. Local paleoclimate data should be considered where available. Analysis should demonstrate not only how the climate has varied and changed, but also regional heterogeneity. Standard, easily understandable metrics should be employed.
- The range of climatic and weather conditions, including extremes, that have occurred in the past and can reasonably be expected to occur in U.S. regions over the near future.
- A critical survey of current global and regional modeling capabilities and their suitability for regional impact assessments and projections. This would include an assessment of their ability to reproduce observed changes. It should also discuss alternative methods for generating projections and forecasts on regional and decadal scales, along the lines of Chapter 10 of the IPCC AR6 WGI Report.
- Assessment of the impacts of recent historical climate variability and change on ecosystems and society. Where long-term data indicate a detectable trend of a regional change, regional projections can be made targeted at the period 2030-2050. Emissions scenarios exceeding RCP4.5/SSP2-4.5 and ECS values exceeding 4°C should not be used. There is no credibility at this time to making regional projections to 2100.

Particularly in terms of future projections, it is important that they be assessed in context of current science capabilities. The pressures toward spatially or temporally precise projections should be resisted as the current models are nowhere up to the task (an example is discussed in CWG25 Section 5.8). In that light, the many pages of NCA5 devoted to projected regional and sectoral impacts have little value.

Given the substantial deficiencies in NCA5 that we have identified, along with the endemic bias of the climate community towards alarmism and policy advocacy, producing an objective NCA6 report with the current NCA organizational construct would be a challenge. A NASEM review could help, but only if the selected participants reflect full viewpoint diversity and do not simply mirror the assumptions and biases of past NCA teams. We regard the CWG25 report to be a good start on NCA6 in terms of scope and objectivity, including adherence to the tenets of Gold Standard Science.

More broadly, we recommend a rewrite of the Global Change Research Act. The current mandate is vague and off point, allowing successive NCA teams to reinterpret the mandate as they see fit. Moreover, it is becoming increasingly clear that current and foreseeable models are not fit-for-purpose to describe regional climates, let alone usefully project them for 25 and 100 years. Further, the use of the term “global change” is ambiguous and outdated.

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APPENDICES

APPENDIX 1: Charge to the review

APPENDIX 2: Reproducibility of NCA5 claim of extreme precipitation trends

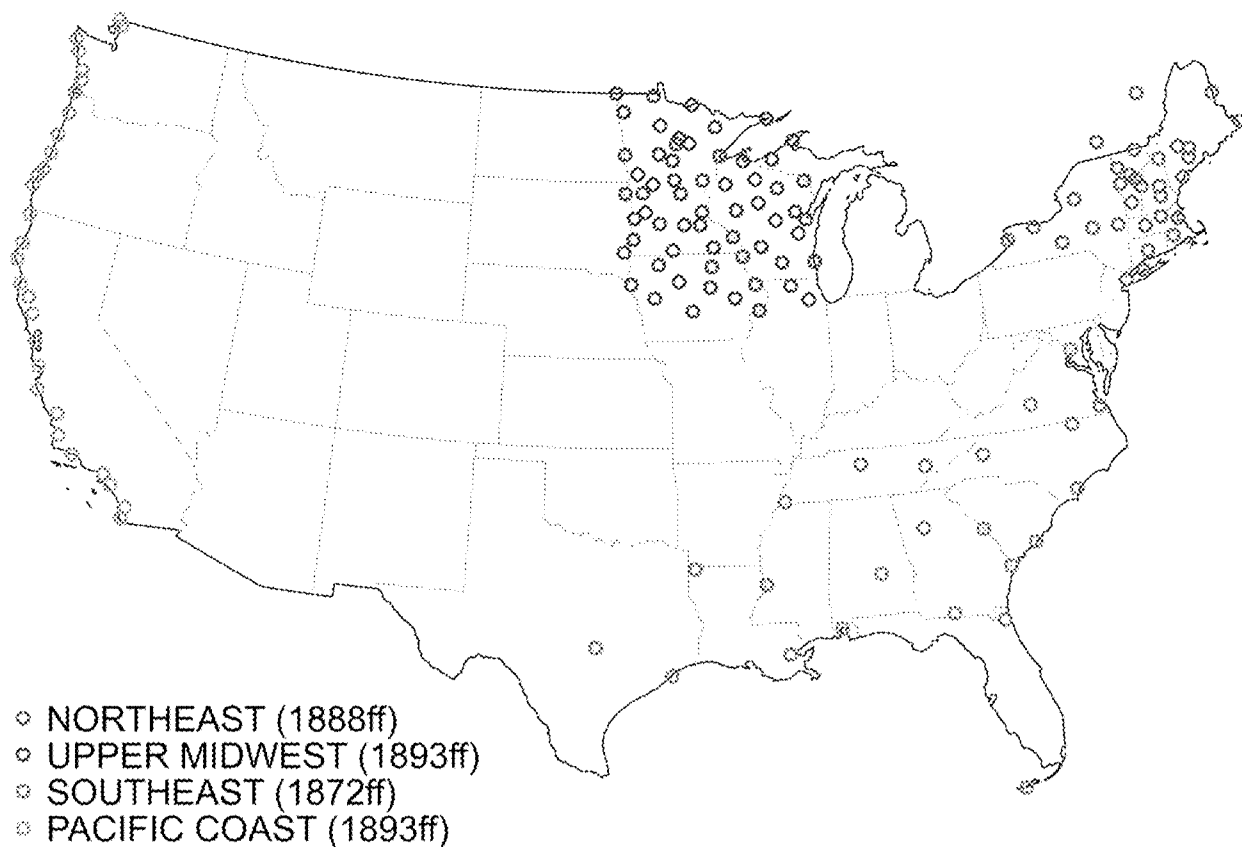


Figure A1: Stations used in the following analyses

Note: All data are available at Christy (2025). Methods as described in McKittrick and Christy (2019), code available at McKittrick and Christy (2025).

Table codes: (-) neg insignificant, -- neg significant, (+) pos insignificant, ++ pos significant.

Column 1: Measure

Column 2: Number of stations in that region

Column 3: Count of stations exhibiting a significant positive trend

Column 3: Count of stations exhibiting a significant negative trend

Column 5: Characteristic of region-wide trend

PACIFIC COAST

Since 1893:

	No. stns	+ trends	- trends	region
1-day average	29	0	1	(-)
2-day average	29	0	1	(-)
Avg on non-zero days	29	0	9	--
Variability	29	1	0	(+)
Annual max	29	2	1	(+)
Number of 99 th pct exceedances	29	1	0	(-)

Since 1950:

	No. stns	+ trends	- trends	region
1-day average	29	0	1	(-)
2-day average	29	0	1	(-)
Avg on non-zero days	29	0	4	(-)
Variability	29	2	3	(-)
Annual max	29	6	3	(-)
Number of 99 th pct exceedances	29	2	1	(-)

Since 1980:

	No. stns	+ trends	- trends	region
1-day average	29	0	0	(-)
2-day average	29	0	0	(-)
Avg on non-zero days	29	0	1	(-)
Variability	29	0	0	(-)
Annual max	29	2	1	(-)
Number of 99 th pct exceedances	29	0	0	(+)

SOUTHEAST

Since 1873:

	No. stns	+ trends	- trends	region
1-day average	24	1	1	(+)
2-day average	24	1	1	(+)
Avg on non-zero days	24	7	2	(+)
Variability	24	1	0	(+)
Annual max	24	2	0	(+)
Number of 99 th pct exceedances	24	5	0	(+)

Since 1950:

	No. stns	+ trends	- trends	region
1-day average	24	5	0	++
2-day average	24	5	0	++
Avg on non-zero days	24	5	1	++
Variability	24	6	0	++
Annual max	24	4	0	++
Number of 99 th pct exceedances	24	4	0	(+)

Since 1980:

	No. stns	+ trends	- trends	region
1-day average	24	5	0	(+)
2-day average	24	5	0	(+)
Avg on non-zero days	24	5	1	(+)
Variability	24	3	0	(+)
Annual max	24	4	0	(+)
Number of 99 th pct exceedances	24	4	0	(+)

MIDWEST

Since 1893:

	No. stns	+ trends	- trends	region
1-day average	61	23	0	++
2-day average	61	23	0	++
Avg on non-zero days	61	2	12	(+)
Variability	61	12	0	++
Annual max	61	9	0	(+)
Number of 99 th pct exceedances	61	10	0	(+)

Since 1950:

	No. stns	+ trends	- trends	region
1-day average	61	28	2	++
2-day average	61	28	2	++
Avg on non-zero days	61	11	1	++
Variability	61	16	0	(+)
Annual max	61	8	0	(+)
Number of 99 th pct exceedances	61	19	0	++

Since 1980:

	No. stns	+ trends	- trends	region
1-day average	61	6	1	(+)
2-day average	61	6	1	(+)
Avg on non-zero days	61	8	2	(+)
Variability	61	5	1	(+)
Annual max	61	0	1	(+)
Number of 99 th pct exceedances	61	5	3	(-)

NORTHEAST

Since 1888:

	No. stns	+ trends	- trends	region
1-day average	27	12	0	++
2-day average	27	12	0	++
Avg on non-zero days	27	7	1	(+)
Variability	27	4	0	(+)
Annual max	27	3	0	(-)
Number of 99 th pct exceedances	27	5	0	(+)

Since 1950:

	No. stns	+ trends	- trends	region
1-day average	27	12	0	++
2-day average	27	12	0	++
Avg on non-zero days	27	7	1	(+)
Variability	27	4	0	(+)
Annual max	27	3	0	(-)
Number of 99 th pct exceedances	27	5	0	++

Since 1980:

	No. stns	+ trends	- trends	region
1-day average	27	10	1	++
2-day average	27	10	1	++
Avg on non-zero days	27	6	0	(+)
Variability	27	2	0	(+)
Annual max	27	1	0	(+)
Number of 99 th pct exceedances	27	1	1	++

ABOUT THE AUTHORS

[Insert updated bios]

From: Judith Curry <curry.judith@gmail.com>
Sent: Wednesday, June 11, 2025 6:54 PM
To: Ross McKittrick
Cc: Steven Koonin; Roy W. Spencer; John Christy
Subject: Re: trigger words

Generally a good idea. Not sure I like Watts. Maybe "model" "natural variability"

On Wed, Jun 11, 2025 at 3:40 PM Ross McKittrick <ross.mckittrick@gmail.com> wrote:
Indigenous on its own: 890 hits

Some technical terms:

Forcing 111

Uncertainty 384

Watts 19

On Wed, Jun 11, 2025 at 4:00 PM Judith Curry <curry.judith@gmail.com> wrote:
I spotted this from an early email from Roy on the NCA5, a word search

Social/Societal keywords

Indigenous/Tribes/Tribal: 1,679

Culture/Culturally: 854

Equity/Equitable: 572

Sustainable: 295

Inequality/Unequal: 201

Racism/Racial: 153

Low-Income: 105

Injustice: 94

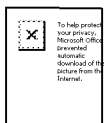
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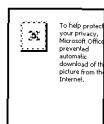
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I'm thinking something along these lines might be suitable re the chapter one overview "non scientific tone" Thoughts?

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From: Ross McKittrick <ross.mckitrick@gmail.com>
Sent: Wednesday, June 11, 2025 6:41 PM
To: Judith Curry
Cc: Steven Koonin; Roy W. Spencer; John Christy
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From: Steven Koonin [steven.koonin@gmail.com]
Sent: 6/11/2025 9:07:30 PM
To: 'Roy Spencer' [roywspencer@hotmail.com]; 'Judith Curry' [curry.judith@gmail.com]
CC: 'John Christy' [climateman60@gmail.com]; 'Ross McKittrick' [ross.mckittrick@gmail.com]
Subject: RE: trigger words
Attachments: ~WRD1380.jpg

We could compare these (accurate) counts with those of more scientific words (e.g., temperature, albedo, clouds, simulation, .).

SEK

From: Roy Spencer <roywspencer@hotmail.com>
Sent: Wednesday, June 11, 2025 4:28 PM
To: Judith Curry <curry.judith@gmail.com>; Steven Koonin <steven.koonin@gmail.com>
Cc: John Christy <climateman60@gmail.com>; Ross McKittrick <ross.mckittrick@gmail.com>
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Whatever everyone decides, the large count for Indigenous/tribes/tribal needs to be redone because "indigenous tribes" usually occur together and so the count is artificially high. I counted the 3 terms separately and added them up.

Sent from my Verizon, Samsung Galaxy smartphone

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Date: 6/11/25 3:00 PM (GMT-06:00)
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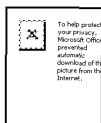
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To help protect
your privacy,
Microsoft Office
prevented
automatic
download of this
picture from the
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<http://www.cfanclimate.net>

From: Judith Curry [curry.judith@gmail.com]
Sent: 7/11/2025 1:59:48 PM
To: Steven Koonin [steven.koonin@gmail.com]
CC: Ross McKittrick [ross.mckitrick@uoguelph.ca]; John Christy [climatemanager60@gmail.com]; Roy W. Spencer [roywspencer@hotmail.com]; Travis Fisher [travis.scott.fisher@gmail.com]; Josh Loucks [loucksj14@gmail.com]
Subject: Re: MS Copilot on our NCA5 critique

the remaining snarky words in CWG25 are in the direct quotes. We might consider removing some of these if it doesn't mess up the page numbering

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I'm OK with this if everyone else is.

More generally, looking at the CoPilot responses, we need to strive for a more serious tone. Appreciate Judy's consistent advocacy for this.

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Other than John's and my JHydro paper, which is cited to disclose the methodology, the other M&C "citations" are the online data archives. Copilot doesn't seem to see the difference between self-citation and data transparency.

Dr. Ross McKittrick
Professor of Economics
Department of Economics and Finance
rossmckittrick.com



University of Guelph | Guelph ON Canada N1G 3P9

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Sent: Thursday, July 10, 2025 6:02 PM
To: Judith Curry <curry.judith@gmail.com>
Cc: Steven Koonin <steven.koonin@gmail.com>; Ross McKittrick <ross.mckittrick@uoguelph.ca>; Roy W. Spencer <roywspencer@hotmail.com>; Travis Fisher <travis.scott.fisher@gmail.com>; Josh Loucks <loucksj14@gmail.com>
Subject: Re: MS Copilot on our NCA5 critique

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While I have some problems with AI not grasping simple points like: McKittrick and Christy is cited because it is the ONLY paper that actually did the precipitation problem correctly (which we stated and pointed out how the other papers failed), the claims the LLM makes are precisely those that we will have to answer ... after all, if we can use AI, so can thousands of those who want to dismiss this effort. It's what it is. Would the result be different if CoPilot knew that we had placed our datafiles out there for public use whereas, there really is no way to exactly reproduce the NCA5 precip results?

John C.

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I think this one makes some very valid points. We should avoid referencing our own papers in this report (apart from CWG report). Rhetorical overreach is valid criticism in some places.

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Food for thought (and perhaps some revisions).

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Here's a structured critique of the document titled "**Critique of the Fifth National Climate Assessment**" (NCA5.ReviewJuly4.pdf), focusing on its treatment of **accuracy, bias, framing, and rhetorical weaknesses**:

Overview of the Document's Intent and Structure

The report positions itself as a formal critique commissioned by the Office of Science and Technology Policy, aiming to evaluate NCA5's scientific quality and policy relevance. It emphasizes adherence to “Gold Standard Science,” aligning with a 2025 executive order, and builds its case by dissecting methodological flaws, perceived overconfidence, and deviations from statutory mandates.

Scientific Accuracy: Strong Methodological Challenges, Selective Reproduction

Strengths

- Highlights real limitations in trend analysis due to short time series and lack of statistical rigor in some NCA5 chapters.
- Points out inconsistent use of confidence levels and ambiguity in attribution statements.
- Raises valid concerns about reliance on extreme emissions scenarios (e.g., SSP5-8.5) without likelihood context.
- Critiques overuse of the NOAA Billion Dollar Disaster dataset—echoing recent peer-reviewed concerns about its reliability as a climate signal.

Limitations

- **Overcorrects** perceived NCA5 exaggerations by heavily emphasizing long-term datasets (e.g., early 20th-century heatwaves) without sufficient attention to current and projected risks under continued warming.
- Selectively cites literature (e.g., CWG25, McKittrick & Christy) while **minimizing mainstream counterpoints** (IPCC reports, attribution science literature).
- Leans heavily on **natural variability explanations**, sometimes oversimplifying the interplay between anthropogenic and internal climate drivers.
- Criticisms of emergent constraints rely on one paper's failure to replicate in CMIP6, but **do not assess the broader modeling literature** or robustness improvements.

Bias and Interpretive Framing: Contrarian with Institutional Distrust

Trait	Evidence
 Tone	Critical, formal, but laden with institutional skepticism
 Framing	Asserts that NCA5 promotes advocacy, not science
 Positioning	Frames NCA5 as ideologically motivated; casts CWG25 as objective remedy
 Language	Uses charged terms like “hyperbolic,” “activist,” “scientific malpractice”
 Source Selection	Strong emphasis on CWG25, Koonin, McKittrick, Pielke Jr.; mainstream literature under-cited

- The critique frequently implies that mainstream climate scientists are **biased or motivated by ideology**, even referencing scientists aiming to “save the planet” as a negative trait.
- It argues that NCA5 authors **usurped the public's right to informed choice**, attributing this to politicization and lack of viewpoint diversity—without robust substantiation.

Rhetorical Weaknesses: Advocacy Masquerading as Technical Review

Examples

- Describes the NCA5 cover image (solar panel installation) as symbolic of “misplaced emphasis,” which is a subjective interpretation masquerading as evidence.
- The Gold Standard Science checklist is cited as if universally accepted, but its origin is politically situated and not broadly recognized by scientific institutions.
- Conflates editorial tone in public-facing chapters with failure of scientific integrity—without separating **audience targeting** from technical content.

Style vs Substance

- The report frequently shifts between scientific criticism and policy ideology, making it hard to distinguish analytical rigor from political positioning.
- Numerous critiques rely on **anecdotal speculation** (e.g., assumptions about NASEM reviewers ignoring visuals) or indirect inferences without direct evidence.

Summary Assessment

Dimension	Verdict
Scientific Validity	Raises important concerns, especially regarding statistical rigor and scenario plausibility
Bias and Objectivity	Leans heavily toward contrarian views; underrepresents mainstream climate literature
Framing Strategy	Positions NCA5 as ideologically driven; presents CWG25 as corrective “gold standard”
Rhetorical Style	Blurs scientific critique with editorial and ideological narrative

Here’s a draft OpEd that distills your structured critique of the NCA5 Review document, highlighting its strengths and pitfalls while maintaining a tone that’s firm, persuasive, and accessible:

When Skepticism Overreaches: A Closer Look at the NCA5 Critique

By [Your Name]

In an era of politicized science and policy-driven urgency, skepticism is both vital and vulnerable. The recent “Critique of the Fifth National Climate Assessment” (NCA5 Review), commissioned under the banner of “Gold Standard Science,” lands with force—but also with heavy baggage. Though it raises legitimate concerns about methodology and modeling, its framing reveals more about its ideological convictions than scientific clarity.

Where the Critique Lands True

There’s no denying some of the document’s sharper points deserve serious attention:

- **Scenario realism** is a recurring challenge in climate assessments. The critique rightly questions the continued reliance on extreme emissions projections like SSP5-8.5, which many researchers consider implausible.
- **Statistical transparency** is essential, and the document is correct to flag ambiguities in trend analysis—particularly when short time windows are used to extrapolate long-term risks.

- **Attribution nuance** matters. The report calls out instances where anthropogenic claims outpace the evidence, especially in regional precipitation and heatwave attribution.

In these domains, the critique acts as a useful calibration tool—reminding the climate community that public-facing assessments must match their rhetorical force with methodological discipline.

⊗ Where the Critique Fails Itself

Unfortunately, the review’s strengths are undercut by its own framing choices. It operates less as an impartial evaluation and more as a **counter-narrative manifesto**:

- **Source selection is narrow**—favoring contrarian voices like McKittrick, Koonin, and Pielke Jr., while largely excluding mainstream literature and rebuttals.
- **Language is loaded**—terms like “scientific malpractice,” “hyperbolic advocacy,” and “activist tone” appear throughout, signaling a deep distrust of institutional climate science rather than a sober critique.
- **Ideological cues** abound—criticisms of solar panel imagery, invocations of President Trump’s “Gold Standard” executive order, and editorialized lamentations about “young scientists trying to save the planet.”

This is not merely critique; it is worldview. And that worldview narrows its lens to the point of **intellectual tunnel vision**—omitting the robust plurality of climate literature in favor of cherry-picked rebuttals.

☒ The Risk of Rhetorical Overreach

Criticism is most powerful when it speaks softly and cites deeply. Yet the NCA5 Review often confuses rhetorical punch for scientific weight. When it speculates that NASEM reviewers “surely would have commented” on a figure they likely never saw, or when it accuses mainstream climate science of “usurping the public’s right to choose,” it steps into the realm of editorialism. That may score points in political circles—but it erodes credibility in scientific ones.

🏠 What We Need Instead

We need climate assessments that:

- Acknowledge uncertainty without inflating it into doubt.
- Embrace epistemic humility without abandoning clarity.
- Explore trade-offs without demonizing action.

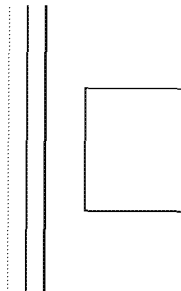
And we need critiques that challenge the science—**not the scientists**—with rigor, fairness, and a commitment to pluralism.

🔑 Conclusion: The Shape of Better Debate

The NCA5 Review reminds us that climate assessments should be probed, not presumed. But it also reminds us that skepticism must answer to its own standard of integrity. When critique becomes crusade, it ceases to clarify and begins to obscure.

Let’s aim higher—on both sides of the debate.

Steve Koonin



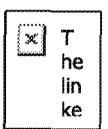
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From: Judith Curry <curry.judith@gmail.com>
Sent: Friday, July 11, 2025 9:51 AM
To: John Christy
Cc: Steven Koonin; Ross McKittrick; Roy W. Spencer; Travis Fisher; Josh Loucks
Subject: Re: MS Copilot on our NCA5 critique

This is really a small point that takes up 10% of our report, and it is too self referential IMO. The authors still don't have final authority, presumably some officials at the USGCRP or other agencies have to sign off on this.

On Fri, Jul 11, 2025 at 5:28 AM John Christy <climateman60@gmail.com> wrote:
Judy

I vote to keep 1.4 because it is on-point (demonstrating the failure of peer review when biased authors have final authority) and directly applies to NCA5 comments on heat. A compromise could be to include it as an appendix.

John C.

Sent from my iPhone

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Professor of Economics

Department of Economics and Finance

rossmckitrick.com

<image001.png>

University of Guelph | Guelph ON Canada N1G 3P9

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■ Rhetorical Weaknesses: Advocacy Masquerading as Technical Review

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■ *When Skepticism Overreaches: A Closer Look at the NCA5 Critique*

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There’s no denying some of the document’s sharper points deserve serious attention:

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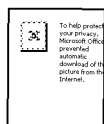
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rossmckittrick.com



University of Guelph | Guelph ON Canada N1G 3P9

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 Scientific Accuracy: Strong Methodological Challenges, Selective Reproduction

 Strengths

- Highlights real limitations in trend analysis due to short time series and lack of statistical rigor in some NCA5 chapters.
- Points out inconsistent use of confidence levels and ambiguity in attribution statements.
- Raises valid concerns about reliance on extreme emissions scenarios (e.g., SSP5-8.5) without likelihood context.
- Critiques overuse of the NOAA Billion Dollar Disaster dataset—echoing recent peer-reviewed concerns about its reliability as a climate signal.

 Limitations

- **Overcorrects** perceived NCA5 exaggerations by heavily emphasizing long-term datasets (e.g., early 20th-century heatwaves) without sufficient attention to current and projected risks under continued warming.
- Selectively cites literature (e.g., CWG25, McKittrick & Christy) while **minimizing mainstream counterpoints** (IPCC reports, attribution science literature).
- Leans heavily on **natural variability explanations**, sometimes oversimplifying the interplay between anthropogenic and internal climate drivers.
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 Bias and Interpretive Framing: Contrarian with Institutional Distrust

Trait	Evidence
 Tone	Critical, formal, but laden with institutional skepticism
 Framing	Asserts that NCA5 promotes advocacy, not science
 Positioning	Frames NCA5 as ideologically motivated; casts CWG25 as objective remedy
 Language	Uses charged terms like "hyperbolic," "activist," "scientific malpractice"
 Source Selection	Strong emphasis on CWG25, Koonin, McKittrick, Pielke Jr.; mainstream literature under-cited

- The critique frequently implies that mainstream climate scientists are **biased or motivated by ideology**, even referencing scientists aiming to "save the planet" as a negative trait.
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Rhetorical Weaknesses: Advocacy Masquerading as Technical Review

Examples

- Describes the NCA5 cover image (solar panel installation) as symbolic of “misplaced emphasis,” which is a subjective interpretation masquerading as evidence.
- The Gold Standard Science checklist is cited as if universally accepted, but its origin is politically situated and not broadly recognized by scientific institutions.
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- The report frequently shifts between scientific criticism and policy ideology, making it hard to distinguish analytical rigor from political positioning.
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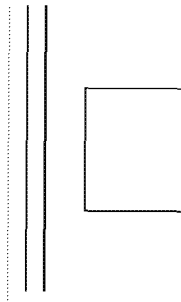
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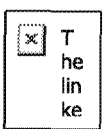
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Sent: Friday, July 11, 2025 8:28 AM
To: Steven Koonin
Cc: Judith Curry; Ross McKittrick; Roy W. Spencer; Travis Fisher; Josh Loucks
Subject: Re: MS Copilot on our NCA5 critique

Judy

I vote to keep 1.4 because it is on-point (demonstrating the failure of peer review when biased authors have final authority) and directly applies to NCA5 comments on heat. A compromise could be to include it as an appendix.

John C.

Sent from my iPhone

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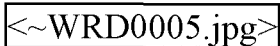
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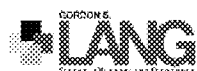
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Department of Economics and Finance
rossmckitrick.com



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Sent: Thursday, July 10, 2025 6:02 PM

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Cc: Steven Koonin <steven.koonin@gmail.com>; Ross McKittrick <ross.mckittrick@uoguelph.ca>; Roy W. Spencer <roywspencer@hotmail.com>; Travis Fisher <travis.scott.fisher@gmail.com>; Josh Loucks <loucksj14@gmail.com>

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✔ **Strengths**

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Trait	Evidence
• Tone	Critical, formal, but laden with institutional skepticism
• Framing	Asserts that NCA5 promotes advocacy, not science
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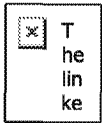
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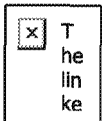
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Let’s aim higher—on both sides of the debate.

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Judith Curry, President
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<http://www.cfanclimate.net>

From: John Christy <climateman60@gmail.com>
Sent: Thursday, July 10, 2025 6:02 PM
To: Judith Curry
Cc: Steven Koonin; Ross McKittrick; Roy W. Spencer; Travis Fisher; Josh Loucks
Subject: Re: MS Copilot on our NCA5 critique

While I have some problems with AI not grasping simple points like: McKittrick and Christy is cited because it is the ONLY paper that actually did the precipitation problem correctly (which we stated and pointed out how the other papers failed), the claims the LLM makes are precisely those that we will have to answer ... after all, if we can use AI, so can thousands of those who want to dismiss this effort. It's what it is. Would the result be different if CoPilot knew that we had placed our datafiles out there for public use whereas, there really is no way to exactly reproduce the NCA5 precip results?

John C.

On Thu, Jul 10, 2025 at 4:25 PM Judith Curry <curry.judith@gmail.com> wrote:

I think this one makes some very valid points. We should avoid referencing our own papers in this report (apart from CWG report). Rhetorical overreach is valid criticism in some places.

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Scientific Accuracy: Strong Methodological Challenges, Selective Reproduction

Strengths

- Highlights real limitations in trend analysis due to short time series and lack of statistical rigor in some NCA5 chapters.
- Points out inconsistent use of confidence levels and ambiguity in attribution statements.
- Raises valid concerns about reliance on extreme emissions scenarios (e.g., SSP5-8.5) without likelihood context.
- Critiques overuse of the NOAA Billion Dollar Disaster dataset—echoing recent peer-reviewed concerns about its reliability as a climate signal.

Limitations

- **Overcorrects** perceived NCA5 exaggerations by heavily emphasizing long-term datasets (e.g., early 20th-century heatwaves) without sufficient attention to current and projected risks under continued warming.
- Selectively cites literature (e.g., CWG25, McKittrick & Christy) while **minimizing mainstream counterpoints** (IPCC reports, attribution science literature).
- Leans heavily on **natural variability explanations**, sometimes oversimplifying the interplay between anthropogenic and internal climate drivers.
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Bias and Interpretive Framing: Contrarian with Institutional Distrust

Trait	Evidence
 Tone	Critical, formal, but laden with institutional skepticism
 Framing	Asserts that NCA5 promotes advocacy, not science
 Positioning	Frames NCA5 as ideologically motivated; casts CWG25 as objective remedy
 Language	Uses charged terms like “hyperbolic,” “activist,” “scientific malpractice”
 Source Selection	Strong emphasis on CWG25, Koonin, McKittrick, Pielke Jr.; mainstream literature under-cited

- The critique frequently implies that mainstream climate scientists are **biased or motivated by ideology**, even referencing scientists aiming to “save the planet” as a negative trait.
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Rhetorical Weaknesses: Advocacy Masquerading as Technical Review

Examples

- Describes the NCA5 cover image (solar panel installation) as symbolic of “misplaced emphasis,” which is a subjective interpretation masquerading as evidence.
- The Gold Standard Science checklist is cited as if universally accepted, but its origin is politically situated and not broadly recognized by scientific institutions.

- Conflates editorial tone in public-facing chapters with failure of scientific integrity—without separating **audience targeting** from technical content.

Style vs Substance

- The report frequently shifts between scientific criticism and policy ideology, making it hard to distinguish analytical rigor from political positioning.
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Summary Assessment

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Scientific Validity	Raises important concerns, especially regarding statistical rigor and scenario plausibility
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When Skepticism Overreaches: A Closer Look at the NCA5 Critique

By [Your Name]

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Where the Critique Lands True

There’s no denying some of the document’s sharper points deserve serious attention:

- **Scenario realism** is a recurring challenge in climate assessments. The critique rightly questions the continued reliance on extreme emissions projections like SSP5-8.5, which many researchers consider implausible.
- **Statistical transparency** is essential, and the document is correct to flag ambiguities in trend analysis—particularly when short time windows are used to extrapolate long-term risks.
- **Attribution nuance** matters. The report calls out instances where anthropogenic claims outpace the evidence, especially in regional precipitation and heatwave attribution.

In these domains, the critique acts as a useful calibration tool—reminding the climate community that public-facing assessments must match their rhetorical force with methodological discipline.

Where the Critique Fails Itself

Unfortunately, the review's strengths are undercut by its own framing choices. It operates less as an impartial evaluation and more as a **counter-narrative manifesto**:

- **Source selection is narrow**—favoring contrarian voices like McKittrick, Koonin, and Pielke Jr., while largely excluding mainstream literature and rebuttals.
- **Language is loaded**—terms like “scientific malpractice,” “hyperbolic advocacy,” and “activist tone” appear throughout, signaling a deep distrust of institutional climate science rather than a sober critique.
- **Ideological cues** abound—criticisms of solar panel imagery, invocations of President Trump’s “Gold Standard” executive order, and editorialized lamentations about “young scientists trying to save the planet.”

This is not merely critique; it is worldview. And that worldview narrows its lens to the point of **intellectual tunnel vision**—omitting the robust plurality of climate literature in favor of cherry-picked rebuttals.

■ The Risk of Rhetorical Overreach

Criticism is most powerful when it speaks softly and cites deeply. Yet the NCA5 Review often confuses rhetorical punch for scientific weight. When it speculates that NASEM reviewers “surely would have commented” on a figure they likely never saw, or when it accuses mainstream climate science of “usurping the public’s right to choose,” it steps into the realm of editorialism. That may score points in political circles—but it erodes credibility in scientific ones.

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We need climate assessments that:

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- **Overcorrects** perceived NCA5 exaggerations by heavily emphasizing long-term datasets (e.g., early 20th-century heatwaves) without sufficient attention to current and projected risks under continued warming.
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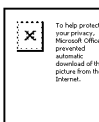
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From: Steven Koonin <steven.koonin@gmail.com>
Sent: Thursday, July 10, 2025 5:12 PM
To: 'Judith Curry'; 'Ross McKittrick'; 'Roy W. Spencer'; 'John Christy'; 'Travis Fisher'; 'Josh Loucks'
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From: Steven Koonin [steven.koonin@gmail.com]
Sent: 6/4/2025 2:43:17 PM
To: 'Judith Curry' [curry.judith@gmail.com]
CC: 'Travis Fisher' [travis.scott.fisher@gmail.com]; 'Roy Spencer' [roywspencer@hotmail.com]; cohen.seth1994@gmail.com; 'Ross McKittrick' [ross.mckittrick@gmail.com]; 'John Christy' [climateman60@gmail.com]; 'Josh Loucks' [loucksj14@gmail.com]
Subject: RE: text for intro
Attachments: ~WRD0001.jpg

Thanks, Judy. It will fit well into the preamble sections

From: Judith Curry <curry.judith@gmail.com>
Sent: Wednesday, June 4, 2025 10:30 AM
To: Steven Koonin <steven.koonin@gmail.com>
Cc: Travis Fisher <travis.scott.fisher@gmail.com>; Roy Spencer <roywspencer@hotmail.com>; cohen.seth1994@gmail.com; Ross McKittrick <ross.mckittrick@gmail.com>; John Christy <climateman60@gmail.com>; Josh Loucks <loucksj14@gmail.com>
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NCA5's Interpretation of its Mission

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NCA5's interpretation of its mission

USGCRP was established by Presidential Initiative in 1989 and mandated by Congress in the Global Change Research Act (GCRA) of 1990 to develop and coordinate “a comprehensive and integrated United States research program which will assist the Nation and the world to understand, assess, predict, and respond to human-induced and natural processes of global change.”

The National Climate Assessment (NCA) Reports evolved from the GCRA requirement to

“Prepare and submit to the President and the Congress an assessment which (1) integrates, evaluates, and interprets the findings of the Program and discusses the scientific uncertainties associated with such findings; (2) analyzes the effects of global change on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biological diversity; and (3) analyzes current trends in global change, both human-induced and natural, and projects major trends for the subsequent 25 to 100 years.”

The five NCA Reports to date have interpreted this mandate in different ways:

- NCA1 (2000) was a multidisciplinary effort to study and portray in regional detail the potential effects of human-induced global warming on the United States.
- In addition to focusing on the potential consequences of climate change, NCA2 (2009) was a relatively short report that also sought to identify potential measures to adapt to climate change and to identify the highest research priorities for the future.
- NCA3 (2014) was an expanded effort that continued along the lines of NCA2, and was distinguished by a comprehensive review process, including a review by the National Academy of Sciences.
- NCA4 (2017/2018) was an expanded effort published in two volumes: I Climate Science Special Report, and II Impacts, Risk, and Adaptation in the United States. This was the first NCA report to devote significant effort to assessing actual climate science. NCA4 introduced a traceability analysis for each key finding, including a cursory description of uncertainties.
- NCA5 (2023) returned to a single volume format, reducing discussion of climate science to a cursory two chapters, with continuing with a focus on regional and sectoral impacts of climate change. NCA5 expanded its remit to topics that are arguably outside the purview of the USGCRP, focusing on “Climate Action” and policy recommendations with a social justice emphasis.

How do these interpretations align with the statutory requirements of the GCRA? Only NCA4 gives serious consideration to climate science, which is a major part of USGCRP funding. Natural climate variability is essentially dismissed as unimportant in NCA4 and barely mentioned in NCA5, in spite of the mandate to include both human-caused and natural climate change. Most significantly, NCA5 has redirected the focus away from climate science and even the hazard elements of impacts, towards evaluation of societal vulnerabilities and advocacy for particular policy options, especially wind and solar power. The cover image for the NCA5 Report is the installation of a solar panel.

As such, the NCA Reports, and particularly the NCA5, are in many ways non-compliant with the GCRA mandate:

- Failure to adequately assess climate science (with the exception of NCA4)
- Failure to consider natural climate variability
- Failure to adequately assess uncertainties.

Further, the confidence levels in the NCA reports are vastly inflated, based on terminology alone. NCA5 conclusions with *medium confidence* are justified by “Suggestive evidence (a few sources, limited consistency, models incomplete, methods emerging, etc.) competing schools of thought. NCA conclusions with *high confidence* are justified by “Moderate evidence (several sources, some consistency, methods vary and/or documentation limited, etc.), medium consensus.

In summary, the NCA reports have arguably been off the mark since the inception of the program. There are many topics that the NCA should have considered but didn't, and the NCA5 in particular has considered topics outside the remit of the USGCRP. The neglect of critical topics and credible uncertainty analyses has led to bias in the reports.

As such, the NCA reports are not an objective source of information to inform U.S. policy. Examples are provided in the remainder of the report.

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Subject: Re: Chapter 7
Attachments: 01.NCA5.Review.June23 Curry.docx

Attached are my edits to the entire NCA doc. I've focused on clarity, and also tightening things up (some red ink that may be controversial)

On Tue, Jun 24, 2025 at 9:03 AM Ross McKittrick <ross.mckittrick@gmail.com> wrote:
Ch 7 seems to be as much about the failure to properly define 'climate change' as failure to discuss natural variability. Perhaps that should be the chapter title.

On Tue, Jun 24, 2025 at 11:48 AM Judith Curry <curry.judith@gmail.com> wrote:
Attached is revised version of Ch 7. I think it is still pretty weak. One way to improve would be to add juicy quote from NASEM rather than just citing relevant pages.

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From: Ross McKittrick <ross.mckitrick@gmail.com>
Sent: Tuesday, June 24, 2025 12:03 PM
To: Judith Curry
Cc: Steven Koonin; John Christy; Roy Spencer; Travis Fisher; Josh Loucks; Seth Cohen
Subject: Re: Chapter 7

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From: Judith Curry [curry.judith@gmail.com]
Sent: 6/24/2025 3:48:34 PM
To: Steven Koonin [steven.koonin@gmail.com]
CC: Ross McKittrick [ross.mckittrick@gmail.com]; John Christy [climatemanager60@gmail.com]; Roy Spencer [roywspencer@hotmail.com]; Travis Fisher [travis.scott.fisher@gmail.com]; Josh Loucks [loucksj14@gmail.com]; Seth Cohen [seth.cohen@hq.doe.gov]
Subject: Chapter 7
Attachments: CH 7 (2).docx

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